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COTTON PRODUCTION IN BRITISH EAST AFRICA . . .

. . . By P. K. Norris*

The annual cotton crop in British East Africa has increased about fivefold since the World War, reaching nearly 475,000 bales of 400 pounds (397,000 United States bales) in 1936. Practically the entire crop is exported, most of it going to British India, Japan, and the United Kingdom. For several years, cotton has been the most valuable export item. The crop has become a factor of considerable economic and social importance in the three territories comprising British East Africa. Government agencies have fostered production as a means of increasing both the cash income of the natives and the state revenues. Official control is exercised over the entire industry, and prices paid to the producers, practically all of whom are natives, are determined by the Government. Further increases in production are anticipated, but at a relatively slow rate. The native cultural methods are still primitive, and damage from insects and disease holds yields to low levels.

Area and Population

British East Africa embraces an area about two and one-half times that of the State of Texas. It lies along the eastern coast of Central Africa and extends west to the Belgian Congo. It is bounded on the north by the Anglo-Egyptian Sudan and Ethiopia, and on the south by Northern Rhodesia, Nyasaland, and the Portuguese colony of Mozambique. The three political divisions making up British East Africa differ in their relations to the British Government and administer their territories independently of each other, but they are similar in general administrative policy. See map facing page 320.

Tanganyika Territory, forming the southern portion of British East Africa, accounts for about 53 percent of the total area. Prior to the World War, this area was known as German East Africa, but since the war it has been administered by Great Britain under a mandate from the League of Nations. Kenya Colony and Protectorate, lying to the north of Tanganyika, represents about 33 percent of the total area, including a strip of land along the coast which is leased from the Sultan of Zanzibar. Uganda Protectorate forms the extreme northwest portion of British East Africa and contains about 14 percent of the total area. While Uganda is the smallest of the three divisions, it is the most important with respect to cotton production, and is larger than the combined States of North and South Carolina. See table, page 326.

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* From a report of a field investigation in East Africa in 1936. Prepared for publication by John L. Stewart, Agricultural Economist, Bureau of Agricultural Economics.

Most of British East Africa is a high plateau, rising from a narrow coastal plain to an elevation of more than 10,000 feet in western Kenya. The elevation of Uganda and Tanganyika ranges from about 3,200 to 4,500 feet, while much of Kenya is more than a mile high. The mountains that dot this plateau are the highest in Africa and, although located on the equator, several of the peaks are snowcapped.

The population of British East Africa is estimated to be in excess of 11,700,000, of which all but about 129,000 are natives. The non-native population includes Arabs, Swahili, Sudanese, Indians (Asiatic), and Europeans. The population is fairly equally distributed among the three divisions, with that of Tanganyika somewhat the largest. Uganda is much the most densely populated. See table, page 319.

The native population is composed of African tribesmen. In the heavily populated areas around Lake Victoria, the natives are of a superior type and include perhaps the most intelligent tribes in Africa. Along the seacoast of Kenya and Tanganyika they are somewhat mixed with Arabs and Swahili. The plateau area between the coast and Lake Victoria is sparsely populated by native tribes, some of which have advanced little beyond the semisavage state. These people live largely by hunting or as herdsmen and follow a primitive form of agriculture, producing corn, beans, cassava, sweet potatoes, and other food crops.

The density of the native population varies greatly, depending upon the soil, rainfall, altitude, and health conditions. In Uganda the average density is estimated at 45 persons to the square mile. The Buganda and Eastern Provinces are the most densely populated. Here the people have developed a relatively high degree of native agriculture and are more settled and industrious than most of the other tribes of East Africa. Along the northern border of Uganda, where the rainfall is light, however, the population is scattered and the inhabitants are more or less nomadic. Most of the natives who follow any gainful occupation are engaged in some form of agriculture.

In Tanganyika the average population is less than 15 persons to the square mile, but in some districts around Lake Victoria it exceeds 200 to the square mile. Other densely populated areas of Tanganyika are the districts north of Lake Nyasaland and around Mount Kilimanjaro and the Kenya-Tanganyika border. Over large sections of central Tanganyika where the land is free from sleeping sickness, scattered tribesmen graze herds of sheep, goats, and cattle. They practice very little agriculture aside from the production of food crops, but are gradually being induced to take up the growing of a cash crop.

Kenya, with an average native population of about 13 persons per square mile, also has a heavy concentration in the districts around Lake Victoria. In some of the lake districts of the Nyanza Province the population exceeds 175 per square mile. More than one-third of the total native population of Kenya lives in the lake region. While many of the people are still primitive in their outlook, within the past few years they have developed a desire for various European manufactured goods. This is a factor of some consequence in connection with the stimulation of cotton production.

BRITISH EAST AFRICA: Area and population, 1936

Territory	Area	Population			
		European	Indian	Native	Total
	Square miles	Number	Number	Number	Number
Kenya........	224,960	16,812	57,135	3,024,975	3,098,922
Tanganyika....	360,000	8,193	29,640	4,950,505	4,988,338
Uganda........	93,981	1,959	15,086	3,623,591	3,640,636
Total.......	678,941	26,964	101,861	11,599,071	11,727,896

Compiled from the latest official censuses and estimates of the Governments of British East Africa.

The Early Years of Cotton Production

Wild cotton was found in the Lake Victoria region by the earliest explorers, and cotton has been cultivated along the coast of what is now Tanganyika and Kenya for more than half a century. Early cultivation in Tanganyika was largely by slave labor under the control of Arab plantation owners. It was practically abandoned when slavery was abolished in 1923. The cotton industry in British East Africa has developed as a result of activities of the colonial officers and missionaries and the encouragement given by semiofficial European cotton-growing organizations. Some of these organizations are still directly or indirectly engaged in the development of cotton in the newer East African areas.

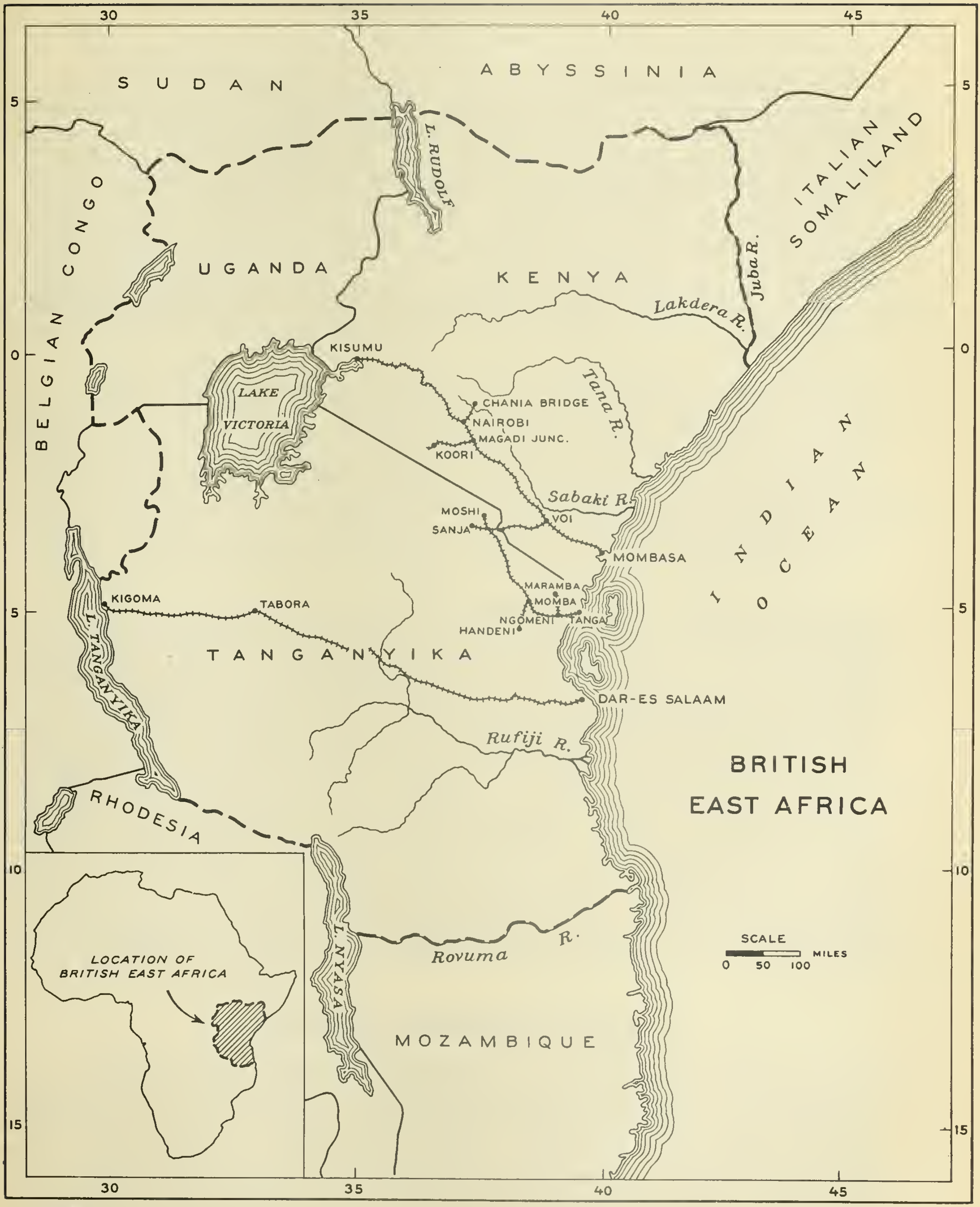
The economic potentialities of cotton production in the regions around Lake Victoria were recognized as early as 1900. The most serious obstacle - the lack of transportation - was removed by the building of the railroad in Kenya from Mombasa on the coast to Kisumu on Lake Victoria (see map), and the subsequent development of steamboat service on the lake. A further impetus was given the industry by the extension of the railroad from Kisumu to Kampala, Uganda, and the construction of a line from Dar-es-Salaam, Tanganyika, to the lake districts of that country.

The early cotton seed brought into Uganda was probably of Egyptian or Sudanese origin and is said to have been introduced by Arab traders. Little is known of this cotton other than that it appears to have been ill suited to the soil and climate. Commercial production dates from 1903, when the seed of American Upland, Egyptian, Peruvian,and Sea Island cottons was distributed to the natives of Buganda province. Of these cottons, the American Upland strain gave the best yields. In 1905 a ton of American Upland seed was planted, and Egyptian cotton was given a further trial at the same time. The advantage of the American over other types was so apparent that since 1906 only American Upland has been grown. Several shipments of seed from the United States of the varieties known as Black Rattler, Sunflower, and Allen were imported during that early period. In 1907, the Government began to exercise control over the seed supply, and by 1917 the entire Uganda crop was produced from seed selected from pure stock. Varieties now used in Uganda have the longest staple of any of the East African cottons. The cotton ranges from an inch to 1-1/8 inches, although the bulk is perhaps not longer than 1-1/32 inches.

In 1919 the Uganda Government imposed a tax on all cotton sold. This tax was earmarked for cotton development, but it soon became evident that such a tax could be used to increase substantially the general revenue, a fact which probably accounts for much of the interest in cotton production displayed by the Government.

The first efforts to develop cotton in Tanganyika were made under German direction about 1900 along the coast and in other areas where transportation was available. The German program proceeded along the line of working plantation labor under European supervision. This system, however, appears to have been unsuccessful in establishing a flourishing industry; and, after the native rebellion of 1906, about 75 percent of the Tanganyika cotton crop was confined to small native plots. During the World War, cotton cultivation virtually ceased in favor of the production of food crops.

Under British administration, cotton growing in Tanganyika was revived, and a Department of Agriculture was established in 1921 with expansion of the cotton area as one of its chief objectives. Railway construction was important in carrying the enterprise inland from the coast to the Lake Victoria region. Cotton is grown largely by natives, but production by others, while representing only a small part of the total, is a noticeable factor. Tanganyika is the only one of the three East African divisions where the growing of cotton is not entirely in the hands of the natives.



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The foundation seed stock used in Tanganyika undoubtedly was imported from the United States, although some of the varieties now used were first grown in other sections of Africa. The staple averages about 1 inch in length and commands a premium in Liverpool over American middling. Varieties have been introduced from neighboring territories in recent years, but little improvement has been made in the varieties in common use. Increased progress has been noted recently in research work affecting varieties of cotton. The British administration has concentrated on encouraging production by natives, pointing out to them that European goods are desirable and that additional quantities of such goods may be obtained by increasing the output of cotton as a cash crop.

In Kenya, practically no interest was displayed in cotton for many years following the break-up of the old Arab slave system. Before the war, a gin was built at Kisumu, the Lake Victoria terminus of the Mombasa railroad, primarily to handle Uganda cotton. Several neighboring Kenya districts utilized the gin, but when it was closed in 1920 the cotton acreage in the Kenya lake area declined to practically nothing. Between 1920 and 1930, the Government encouraged the building of gins, but not enough cotton was produced to keep the gins in operation.

In the coast area, an attempt made in 1923 to interest natives in cotton growing by distributing seed from Uganda met with some degree of success, and the necessary gins were built. By 1931, the Government became committed to a policy of intensively encouraging cotton production. All areas where cotton had been tried in earlier years, and some new regions in central Kenya, were brought into the program, which resulted in a substantial increase in the number of native growers. The varieties now in use are very similar to those of the other East African territories and doubtless come from the same foundation stock. The present staple length is about 1-1/32 inches. Grade is largely dependent upon the weather but is somewhat below that of Uganda cotton. Recently more attention has been given the problem of breeding an improved variety. Since 1931, production has increased in the coastal and lake areas, but it is still in the experimental stages in the central regions. As in Uganda, the Government regards the cotton export tax as an important source of revenue.

The Present Importance of Cotton

British East Africa is primarily an agricultural country, and the production and marketing of raw agricultural commodities is the basis for the bulk of the trade and commerce. While growing a food supply is the chief concern of the native farmer, a number of cash crops also are grown and exported, the most important being cotton, coffee, sisal hemp, sugar, tea, and tobacco. The 1935 export value of cotton, coffee, and sisal hemp, the three leading crops, exceeded $33,000,000. If the value of the less important exports is added, the total of the export trade amounts to nearly $44,000,000. See table, page 322.

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For a number of years, cotton has held first place in export value, followed by coffee and sisal hemp. In 1935, cotton accounted for over 38 percent of the total value of all agricultural exports from British East Africa, coffee about 18 percent, and sisal hemp 17 percent. All of the 1935 figures shown in the table below represent increases over exports of other recent years, the increases being accounted for by advances in both price and volume of business.

About 82 percent of the total value of the cotton exports from British East Africa in 1935 originated in Uganda, 16 percent in Tanganyika, and 2 percent in Kenya. While the latter two divisions are showing increased interest in cotton, each of them has one or two export crops of greater importance than cotton. In Uganda, the proportion of total exports represented by cotton has been increasing in recent years, reaching 81 percent in 1935. The 1935 movement of cotton from Tanganyika accounted for about 20 percent of the total trade of that division whereas sisal hemp represented 39 percent. In Kenya, the value of cotton exports was only 3 percent of the 1935 total exports while coffee amounted to 37 percent. See table below.

BRITISH EAST AFRICA: Value of agricultural commodities exported in 1935

Commodity	Tanganyika	Uganda	Kenya	Total
	Dollars	Dollars	Dollars	Dollars
Cotton	2,791,783	13,836,392	374,132	17,002,307
Sisal	5,562,185	-	2,073,994	7,636,179
Coffee	2,386,383	1,132,189	4,582,769	8,101,341
Corn	17,549	5	906,654	924,207
Sugar	-	825,250	259,676	1,084,926
Peanuts	1,029,458	80,683	3,563	1,113,705
All other agricultural commodities	2,241,874	1,497,949	4,103,686	7,843,509
Total	14,029,232	17,372,468	12,304,474	43,706,174

Compiled from the official reports of the Governments of British East Africa.

Expansion of the Cotton Enterprise

The official activity in fostering East African cotton production has not been accompanied by comprehensive statistical records of the results obtained. With the exception of information on production in Uganda, there are few, if any, data on area and yields. Figures used to reflect production usually are the records of the movement of cotton on railroads. These data are tabulated without regard to districts or Provinces, thus making it difficult, if not impossible, to examine the trends in many important producing areas. Recently, a growing public interest has emphasized the desirability of more complete statistics.

Acreage

In Uganda, the only division for which complete statistics are available, the trend in cotton acreage has been sharply upward since the crop was first planted in 1903. During the past 15 years, acreage has increased from 345,000 to 1,488,000 acres. With one or two exceptions, each succeeding year has shown an increase. The million-acre mark was reached in 1933, a year in which world cotton prices were at a low level. From 1929 to 1936 acreage increased steadily, even though cotton prices were relatively low during much of this period.

As previously indicated, Government policy has been the dominating influence in the expansion of cotton in Uganda. Since a large part of the revenue comes from the tax on cotton, it is regarded as imperative that acreage be maintained or increased. So important a revenue item is the tax on cotton that any proposed increase in Government budgets is based upon a compensatory increase in the cotton acreage.

The trend in cotton acreage in Tanganyika and Kenya is known to have been very irregular during the past 20 years. Statistics are lacking, but Government officers working in the cotton areas of these two divisions report that fluctuations have been largely the result of the degree to which the Government has stimulated production. In years when the Government felt it was advisable to increase the cash income of the natives, cotton seed was distributed free to the chiefs with instructions that the people plant it. This action was usually based on the natives' need for cash to pay the poll tax. After seasons in which the sale of food crops by natives was sufficient to pay the poll tax, or when work in European coffee and sisal plantations was plentiful, little cotton was planted. The growing of cotton for tax purposes often resulted in an increased crop during years of low prices.

Yields

Yields in Uganda on the whole are rather low and show a slight downward trend. In districts where a high percentage of the land is under cultivation, much of it is badly eroded and the fertility depleted. Insects also are becoming numerous, which reacts unfavorably upon yields. An average yield of 100 pounds of ginned cotton per acre is about normal, but on good land with proper cultivation yields as high as 200 pounds are obtained. The average for the years 1932-1936 is just under 100 pounds. It seems to have been the policy in the past to encourage increases in acreage without much regard to yields. The fact that the early varieties gave fair yields was a matter of luck rather than the result of breeding and selection.

In Tanganyika and Kenya, the common opinion is that over a period of years yields do not average more than 100 pounds of lint per acre.

The average yield in those two divisions has not been improved by the breeding or developing of a variety more suited to local conditions. Reliance has been placed almost exclusively upon varieties imported from Uganda. As in that country, particularly in the older centers of production, yields are said to be declining as a result of insect pests, disease, and reduced soil fertility. It has been observed, also, that in the more recently developed districts, where the people are still somewhat primitive in their outlook, better yields would be obtained if improved cultural methods were followed.

Production a/

Since 1922 total cotton production in the three divisions of East Africa increased from 95,000 bales of 400 pounds each to an estimated 1936 crop of 470,000 bales. The latter figure is the highest recorded for the period indicated, while the 1922 figure was the lowest. With the exception of 3 or 4 years, each crop harvested showed an increase over that of the preceding year, often by more than 25 percent. See table, page 326.

It is reported that in Uganda 2 bales of cotton were produced in 1903. A steady increase in annual output brought the 1936 crop up to an estimated 375,000 bales. That figure represented 80 percent of the estimated 1936 production for all British East Africa. In 1923 the crop totaled more than 100,000 bales. During 1926 and 1927, production showed a decline but recovered in 1928 with a crop of 204,000 bales. Production declined in 1929 because of low yields resulting from disease, but by 1931 it had again exceeded 200,000 bales. Low yields reduced the crops of 1933 and 1934, but the following two crops were larger. These variations in production were accompanied by a steady increase in acreage. More than three-fourths of the Uganda crop is produced in the Buganda and Eastern Provinces, the two most heavily populated, where cotton was first firmly established in that country. See table, page 325.

In Tanganyika, the bulk of the cotton production is found in the area around Lake Victoria. Under German administration, production reached some 10,000 bales annually but practically died out during and immediately after the World War. By 1922, production had recovered to more than 7,000 bales. Thereafter, production tended to increase, fluctuating sharply in some years, largely under the influence of price changes. The 1936 crop is placed at around 75,000 bales, or about 16 percent of the East African total. Price appears to influence the Tanganyika crop to a greater degree than that of either Kenya or Uganda, probably because the Tanganyika Government, until recently, was not interested in pushing cotton to the same extent as were the Governments of

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a/ All figures on production are given in terms of the 400-pound bale used for East African cotton. To convert to the equivalent in American bales, multiply by 0.837.

the other two divisions. The recent official interest in cotton in Tanganyika is the result almost entirely of the need for more freight for the Government-owned railroads. Cotton production also facilitates the collection of the poll tax, and increases the trade of the territory even though prices may be low.

In Kenya, also, the bulk of the cotton crop is grown in the vicinity of Lake Victoria. The 1936 crop is estimated to be about 20,000 bales. While this is of little importance in the total East African crop, it represents an increase of almost 400 percent since 1930. Prior to that year, cotton growing in the colony received little encouragement, but more recently the crop has been of special concern to the Government. Nyanza Province, bordering on the lake and adjacent to Uganda, is the leading producing region. The crop there increased from 700 bales in 1930 to an estimated 15,000 bales for 1936.

The increased production in Nyanza and elsewhere in Kenya illustrates an inverse response to prices. When the prices of agricultural commodities began to decline in 1929 and 1930, a considerable number of natives employed on European farms producing crops other than cotton were released and returned home. Having become accustomed to a cash income, these people were not willing to return to tribal life, and their desire for cash made it easy to persuade them to grow cotton. Many of the natives who started cotton growing during this period expanded their operations each year even though prices declined. New gins were built and production has now reached the point where the revenue from the cotton tax is of sufficient size to be a factor in the Government budget. The future of cotton in Kenya, therefore, is of considerable official concern.

UGANDA: Area, yield per acre, and production of lint cotton, calendar years 1925 to 1936

Year	Area	Yield per acre	Production a/
	Acres	Pounds	Bales
1925	610,325	119	180,859
1926	570,189	92	131,728
1927	533,004	104	138,486
1928	699,107	117	204,057
1929	663,157	78	129,122
1930	739,690	102	188,920
1931	865,259	96	207,326
1932	1,071,410	110	294,828
1933	1,090,502	105	285,642
1934	1,185,599	85	253,242
1935	1,365,529	94	b/ 320,000
1936	1,487,768	101	b/ 375,000

Compiled from the records of the Uganda Department of Agriculture, Entebbe, Uganda. a/ Bales of 400 pounds. b/ Estimate.

BRITISH EAST AFRICA: Cotton production, 1922 to 1936 a/,
(In bales of 400 pounds)

Year	Kenya	Tanganyika	Uganda	Total
	Bales	Bales	Bales	Bales
1922..............	b/	7,175	88,046	95,221
1923..............	b/	11,434	128,604	140,038
1924..............	170	17,549	196,038	213,757
1925..............	424	21,724	180,859	203,007
1926..............	261	24,281	131,728	156,270
1927..............	142	15,966	138,486	154,594
1928..............	632	32,954	204,057	237,643
1929..............	101	27,785	129,122	157,008
1930..............	783	23,135	188,920	212,838
1931..............	1,735	11,351	207,326	220,412
1932..............	4,276	18,039	294,828	317,143
1933..............	6,749	30,833	285,642	323,224
1934..............	8,773	39,007	253,242	301,022
1935..............	15,636	58,548	c/ 320,000	c/394,184
1936..............	c/ 20,000	c/ 75,000	c/ 375,000	c/470,000

Compiled from the official reports of the Governments of British East Africa.

a/ The movements of the crop (sometimes called exports) from the areas of production as shown by the railroad records. Since the cotton may be stored in the port for several months after its arrival, this figure need not check with the actual exports to oversea points.

b/ Not available.

c/ Estimates.

Estimates and Forecasts

Only in Uganda does the Government issue a regular statement dealing exclusively with cotton statistics. Various official annual reports are published in which reference is made to cotton production, exports, and value. Each of the three Governments issues an annual report in which the acreage, yield, production, and value, as well as amounts of cotton ginned within the chief areas are given, but this information is not uniform for all three divisions.

The Department of Agriculture of Uganda issues monthly bulletins known as "Cotton Reports." This release gives the amount of cotton ginned, the export tax collected, and the area planted. Comments on the weather and crop conditions in the various districts also are included. The total area planted is usually given in the October release. Beginning about January, the monthly purchase of cotton by gins is reported, as well as other data regarding the movement of the crop. Ginners are required to make monthly reports of their purchases, which regularize this information. The export tonnage is all moved by rail to the coast and can be recorded as freight movement or as goods taxed for export.

Estimates of the acreage planted are based on sample areas. Each village chief in the area sampled is required to report shortly after the close of the planting season the number of plots planted by his people. An agricultural officer then checks the reports of the chiefs, and by measuring a number of sample plots arrives at an average plot area. This is then multiplied by the number of plots in the village. The early estimates of yields are largely the personal guesses of the officials. As the crop is harvested, the yield is checked and the estimates revised and corrected.

The cotton purchased by ginners is reported in pounds of seed cotton. The Government uses a gin turn-out of 30 percent in converting seed cotton to lint. At the end of the season, it is always found that the number of bales thus obtained is less than the number exported as shown by the railroad bills of lading. This discrepancy exists because the factor used in converting seed cotton to lint is too low and because the ginners do not buy all of the cotton they gin. All cotton, however, is finally accounted for in the records of shipments by rail. These figures, therefore, are used in Uganda as the final statistics of production.

In Tanganyika the only data on the final crop outturn are the statistics on exports published at the end of each year. In Kenya, also, the export figures are so used, although the production in scattered areas may be referred to in the annual reports of the Department of Agriculture. In neither division is an attempt made to issue acreage or production forecasts for public use. An estimate of production is made prior to the actual harvest, but the figures are not published, and are intended primarily for the guidance of the railway traffic officials. A close check, however, is kept on the movement of the crop into trade channels, and reports on the movement are sometimes released. Cotton ginners make estimates of production in their areas, but the estimates are private or are available only to Government officers.

Area Available for Cotton

There is no apparent shortage of cultivable land in British East Africa. It must not be inferred, however, that the whole territory is suitable for agriculture or could be made to produce cotton. Much of it is in swamps, mountains, and waste lands, while large sections are given over to game preserves. Such tropical diseases as sleeping sickness and malaria render other sections unfit for human habitation. Large areas in Kenya and Tanganyika, and to a lesser extent in Uganda, while suitable for other crops, are entirely unfit for cotton. Such expansion of the cotton acreage as has occurred, however, does not appear to have encroached upon the acreage necessary for food production or for grazing. There is still an abundant supply of unused land suitable for cotton production.

Although located on the equator, much of Kenya and Tanganyika is too cool for cotton growing because of the high elevation. Experiments show that at elevations above 4,500 feet in Kenya and Uganda and 3,500 feet in Tanganyika cotton is not a profitable crop. It is estimated that almost half of East Africa has an elevation higher than 4,500 feet. Much of Tanganyika and Kenya lies more than a mile above sea level, and some sections are from 8,000 to 14,000 feet high. A large part of Uganda is below 3,500 feet in elevation, but in the extreme southwest and along the Kenya border it is too high for cotton. Most of the other sections of Uganda range from 3,500 to 4,500 feet above sea level.

Soils

Throughout East Africa the soils of the lower elevations on the whole are fertile enough to produce cotton. The coast soils as a class are sandy, but along the rivers and creeks black, alluvial clay soils are common. At several places along the coast, "black cotton soils" are found in small deltas. In the hill districts a short distance from the coast, the common soils are red sandy loams. Beyond these sandy ridges is a plateau, much of which is low enough and the soil fertile enough for cotton growing, but the light rainfall renders this impracticable without irrigation.

The most common soils of the cotton regions are the loams found around Lake Victoria. These soils vary from a red to a dark chocolate color. The low areas and creek bottoms are a dark sandy to clay loam, while the hills and uplands are a red to a light red sandy loam, which erodes badly when cultivated. They contain little organic matter, but as a rule have a high content of lime, potash, and phosphate.

Erosion is most common in a belt about 50 miles wide around the lake, known as the "elephant grass district." It is an area of heavy rainfall and rank vegetation. Beyond the elephant grass district is a quite different region referred to as the "short grass district." The soils of the short grass area, while much the same as those around the lake, have a higher clay content and on the whole are darker in color. They are not so deep, but as a rule do not erode as badly as the elephant grass soils. Some of the best cotton of the country is grown on this type of soil. To the north of the short grass belt, but of less importance because of the decreasing rainfall, are a number of dark-colored, sandy loam soils. Although these soils are sometimes referred to as black cotton soils, they produce very little cotton and are largely uncultivated.

Over much of the well-established cotton-growing area, soil erosion is a serious problem. The soil texture and the topography are such that the tropical rains and the native system of cultivation have resulted in the abandonment of a considerable area. Cotton-growing has accelerated this waste.

Prior to the development of cotton, it was the common practice to clear new land each year for food and to allow the old patch to revert to wild vegetation. With the introduction of cotton, the native farmers largely discontinued this practice and began growing cotton on the same field year after year. The reason for this is not a scarcity of land but rather the labor habits of the natives. To clear and plant even a small area, in addition to that which is required for food, involves more labor than the average native is willing to perform. The result of repeated cotton plantings is a considerable increase in abandoned areas because of erosion.

Rainfall and the Growing Season

The volume of rainfall and its distribution is an outstanding factor in East African agriculture, particularly for cotton. Rains may occur at any time, but as a general rule the wet season, or season of "long rains", comes in the first half of the year. The second half of the year brings the dry season, or season of "short rains." The seasons, however, are not always clearly defined.

The coastal cotton belt has a wide range of climatic conditions. Normally, rains start along the Tanganyika coast in December or early January. Along the Kenya coast, light rains start about March, followed by heavy rains a month later. The rains gradually decrease from June until the end of October, when the dry season sets in. The average rainfall along the Tanganyika coast is above 45 inches annually and decreases to about 35 inches along the northern Kenya coast. As a rule, May is the month of heaviest rainfall, frequently accounting for as much as one-third of the annual total. December and January are usually months of little or no rain along the coast of Tanganyika, while January and February are the months of light rainfall on the Kenya coast.

In the lake districts, the rainfall increases from south to north. The Tanganyika area, located to the south and east of Lake Victoria, has an annual rainfall of about 40 inches, while to the east and north, in Kenya and Uganda, the fall is more than 50 inches. Outside the lake area, however, the rainfall is under that figure.

In Uganda, the cotton-growing regions have an average annual rainfall of from 35 to 50 inches, which is roughly divided into two seasons. The season of heavy rains extends from late February to about the first of June, while the dry season starts in August and extends into November. As a rule, December - January and June - July are dry periods. Around the lake the two seasons are not very well defined, the dry periods being scarcely noticeable.

The mean monthly temperatures of Uganda range between 70° and 72°, varying little from season to season. The daily range, however, is rather noticeable. While the monthly mean from January to July may not vary more than 4°, the daily changes along the northern border of the cotton belt are much greater. These changes are important in fixing the northern or "upper" boundary of the cotton-growing area. In the regions where the elevation is too high for cotton, the temperature is not always low enough to kill the plant outright, but the period required for maturity is lengthened. It so happens that this prolonged growing season does not fit into the rainfall distribution, a fact which contributes to a very low yield or no yield at all.

The lake district of Tanganyika has a fair rainfall distribution. As a rule, rains start in October and November and continue through May. April and May are months of heavy rainfall, while "short rains" fall during July and August. This distribution fits well into the cotton growing and harvesting seasons. The crop is planted from December to February, during a period of high temperatures, and harvested during the drier period of July to September. Throughout the growing season, the monthly rainfall as a rule is ample and well distributed.

The Kenya lake district likewise has a fair rainfall distribution during the growing season. The crop is planted during July and August. Usually it is completely harvested by February, but late plantings may remain in the fields until March. In the area immediately adjoining Lake Victoria the rainfall may average 50 inches annually but a few miles inland it is considerably less, and some of the northern districts often are short of moisture. This fact, together with the high elevations to the north and east, limits the cotton-growing area of the Nyanza Province to a small area around the lake.

Insects and Diseases

Though cotton is a comparatively new crop in East Africa, a number of the most serious insect pests and diseases have become common in all three divisions. The most widespread insects are jassids (Empoasca facialis), cotton stainers (Dysdercus spp. oxycaremus), white ants, grasshoppers, stem girdlers, leafhoppers, blossom beetles, "lygus" (Lygus vosseleri), aphids (Aphis gossypii), pink bollworms (Platyedra gossypiella), and common bollworms (Chloridea obsoleta). Black arm (caused by Bacterium malvacearum) is the most destructive disease at present, although others, some of which have not been identified, also are common.

Insects and diseases are factors in preventing the growth of cotton in the higher altitudes. Cool temperatures prolong the growing season but do not prevent the insects from multiplying. It is not uncommon for cotton growing at the higher altitudes to require as long as 10 to 13 months in which to mature. Because of the length of this period, the cotton stainer, the bollworm, the pink bollworm, and other insects become so numerous that it is almost impossible to harvest a crop. Equally difficult conditions prevail along the coast, where rain may interfere with harvesting. Unless the crop is planted soon after the first of the "long rains" it will not be harvested before the "short rains" start. Under such conditions, the heavy growth of plants and weeds and the increase in insects greatly reduce the yields, and the lint obtained is badly damaged by the cotton stainer.

With the exception of the lake district of Tanganyika, the pink bollworm has spread over the entire cotton area of East Africa, and a special effort is being made to keep the lake district free from infection. The area of central Tanganyika which does not produce cotton has helped to prevent the pest from reaching the lake region, but the continued success of this natural barrier is in doubt. Most of the cotton insects and diseases have become widespread only in recent years, and new insects are being discovered from time to time. Virtually the only control method now practiced is clearing the fields after harvest. As a rule, however, the native farmers are not interested in the extra work involved.

There are no estimates available as to the amount of damage done by pests and insects. Their control is one of the major problems confronting the various Governments of East Africa. Under present conditions, however, it may be anticipated that losses will increase if the cotton acreage is expanded or cultivation is intensified.

Farm Organization

Until the white man taught him to grow a cash crop, the East African native produced only food crops, and the cultivation of the latter is still his chief agricultural enterprise. Even in areas where cotton is well established, most of the land under cultivation is planted to plantain, sweet potatoes, peanuts, corn, millet, cowpeas, beans, and other food crops.

The agricultural habits of the various tribes differ, but the people in the cotton-growing areas tend to follow a common type of cultivation. This is because of the general supervision of cotton given by the Governments and the similarity of the soil and climatic conditions. Cotton is grown almost entirely by natives without white supervision other than that given by the Government agricultural officers. The crop is produced on land owned by the grower or held by the village in common or owned by a local chief. Europeans and Indians, with few exceptions, are not engaged in cotton production either as growers or as landlords.

The average farm consists of a number of small plots scattered about within a radius of a mile of the native hut or village. On these patches, few of which are larger than an acre and the total of which may not exceed 4 or 5 acres, the native family grows food and cotton. The task of clearing away the bush, planting, cultivating, and harvesting is largely performed with hand tools. Very few native cotton growers use any form of animal power, although in some areas of Uganda oxen are used for breaking the land. The planting and cultivating is done with a hand hoe. The growing of food is largely the task of the women, while both men and women cultivate the cotton patches. Though the tribes of the cotton areas no longer follow a nomadic life, there is still a strong tendency on the part of men to spend their time hunting or fishing and to leave the cultivation of the land to the women.

In preparing new cotton land, the vegetation usually is burned off, and the seed is planted in rows 3 to 5 feet apart. As a rule, plants are thinned to one or two in hills about a foot to 2 feet apart, depending on the soil fertility. Sometimes cotton is planted for 2 or 3 years in succession on the same land, after which the land is allowed to revert to wild vegetation. The land near the hut or the village is often kept under cultivation longer than that in outlying areas. If the land around the village becomes exhausted, the whole village may move to a new location. After a few years the once-used lands recover and the village may return to its former site.

While the Government has followed a policy of encouraging the use of plows for breaking the cotton land, it is doubtful if the practice is in fact an improvement over the native system. In villages where plowing is common, it is largely a community enterprise. Several men may own a plow or it may be owned by an individual who plows for the entire village. The plows are drawn by oxen, four to eight being required. Cattle are looked upon as weath, and every farmer does not own enough oxen for a plow team. If a plowman is employed, the individual farmer is often required to pay more than the work justifies.

It appears, also, that plowing has resulted in increased erosion. The land is so rolling that under the best of conditions erosion is a problem. When the land is cleared and the soil plowed, it is almost sure to wash away in a short time. The common practice of clearing a strip that includes in the same field a part of the rich creek bottom land and a part of the adjoining hillside and of plowing of the land up and down the hill rather than in contour increases erosion. When such patches are plowed by an ox plow, the soil is often washed away to the depth of the annual plowing.

The usual method of cultivation is to scrape the weeds off the surface with a short hand hoe, thus stirring the soil as little as possible. The land is left rough, and the dead grass and weeds are allowed to remain on the surface. In some areas this residue is arranged in rows across the slope of the hill, forming a crude terrace.

A few acres of food crops and an acre of cotton will require the entire time of an average family. Cotton, like the other crops, may be raised on several patches in different directions from the village. One or more members of a family may own cotton patches, but the food crops are the common property of the family. The amount of time the average native spends in field labor aside from the time required to produce food is largely measured by the desire for the commodities to be obtained from the local trader. Working as he does with a hand hoe and having to grow food crops as well, the native can cultivate only a limited area of cotton. The past expansion of cotton acreage is largely the result of an increase in the number of patches planted rather than an increase in the size of the patch. Some increase in the size of the patch may occur; but, until the hand hoe is supplanted by some form of power cultivation or the native is induced to spend a larger part of his time in the fields, this in unlikely.

Cost of Production

Production cost items familiar to the American producer have little meaning for the cotton grower of East Africa. Rent, if paid at all, is based on tribal custom and has little direct connection with cotton. Labor and land that would otherwise be unemployed are used in cotton cultivation. No commercial fertilizer or irrigation is required, and there is almost no capital invested. The seed is furnished free by the Government. Ginning, handling, and export taxes are paid by the buyer of the seed cotton, and the native has no knowledge of the cost.

The amount of the hut or poll tax is an important item to the grower. This tax is not directly connected with cotton but it is often based on the cash income of the village, in which cotton has an outstanding place. In areas where cotton is widely grown and where the average cash income per native is fairly high, this personal tax is higher than in areas where little or no cotton is grown. Practically no hired labor is used in growing cotton. The only equipment required is a hand hoe worth about 25 cents. If the land is rented, it may cost about $2.50 per acre per family for both food and cotton areas. Local chiefs may, however, receive a tribute in addition to this.

The cost of production in each country is largely under Government control. The cost of ginning and inland transportation, and the export tax and profit to dealers may vary according to what each Government thinks the industry can stand. The power to fix a minimum price permits control of these items of cost. For example, an increase in the Liverpool price of cotton might result in an increase in the export tax or the freight rate on the Government-owned railroads, but such increases would be considered in fixing the price. The cost of handling cotton from the time it leaves the native grower until it is landed in a foreign port may amount to as much as 400 Liverpool points (8 cents per pound). The return to the grower is often but 2 or 3 cents per pound of seed cotton. It is the general opinion of the authorities that the industry can expand on a Liverpool price of 12 cents per pound and at 10 cents per pound can hold its own.

There is little competition between cash and food crops. The Governments insist that each chief require his people to plant food crops and that each family store a part of the crop in a community granary to be used during years of famine or short crops.

The need for credit or financial aid to the cotton grower of East Africa has never arisen. The average grower produces his crops of food and cotton without a cash outlay. As the economic wants of the growers increase, a system of selling on credit or advancing cash may come into general use, but at present it is of minor importance. The marketing of the crop is financed by regular commercial banks located in the larger inland towns and at export points. The handling of the crop after it leaves the hands of the native grower requires a cash outlay, but this is of no direct interest to the grower.

Marketing of cotton in East Africa, like production, is Government controlled and closely supervised. The methods now followed grew out of practices developed in Uganda. Tanganyika and Kenya have taken the Uganda system as a pattern and adjusted it to local conditions. The supervision exercised by all these Governments is now fundamentally the same. A description of the Uganda markets, therefore, will apply to the entire area.

From the standpoint of the native, marketing cotton is a simple matter. The crop is picked and transported to the nearest buying center in small quantities, usually on the head of the grower. At the market place the cotton is examined and the grower is paid in cash. All cotton throughout East Africa is sold in the seed. The gin is the primary market, but as a matter of convenience the ginners may have a number of buying stations located throughout the cotton belt. A station usually consists of a small warehouse where the seed cotton is stored until transported to the gin. In the early stages of the industry there were a number of middlemen or commission merchants who purchased cotton from the natives and resold it to larger merchants or ginners. Under this system, price spreads developed which were regarded as so unfavorable to the growers as to cause Government action to bring about a more direct contact between ginners and growers. The marketing regulations have been changed from time to time and now give the Governments complete control of every phase of the industry.

Under existing regulations, the construction and operation of cotton gins and the purchase and transportation of seed cotton are allowed only by license obtained from the Governments. Everyone who deals in any way with cotton from the time it leaves the grower until it is exported from the country is required to have a license and therefore comes under official control.

About 1929 a committee investigated the cotton industry of Uganda and recommended that the number of gins and buyers be materially reduced because of the limited amount of cotton available for each gin. It was claimed that the portion of the crop handled by each gin was so small and the overhead cost of operation so high that gins could not pay growers the full value of the cotton and at the same time make a profit. It was also suggested that, if unrestricted competition were allowed to continue, a number of ginners would be forced into bankruptcy and that shortly the grower would be at the mercy of the few who were able to survive.

Each gin is now given a fixed quota of cotton for the season. If more cotton than the quota is ginned, a penalty is assessed; if less than the quota, a bonus is paid. For example, if a ginner is allotted 10 percent of the crop of a district but gins 12 percent, a tax is paid on 2 percent. Some ginner in the district gins less than the allotted quota, and the assessment paid by the ginner who exceeds the quota will go to the one who does not receive the full quota of cotton. This, in the opinion of the Government, tends to compensate for overhead cost and to enable the ginner who handles but a small part of the crop to pay the grower the full price for his cotton and at the same time make a profit.

Under this system the Government has created a monopoly for those who are now engaged in cotton buying and ginning. Competition between the ginners within the districts has been eliminated by the system of quotas, and the transportation of seed cotton from one district to another is prohibited. In consideration of this control, however, the price at which ginners may purchase cotton is fixed. The dates on which the purchase of cotton may start at the beginning of the season and on which the various grades may be purchased also are specified. Natives are not allowed to offer for sale dirty or stained cotton that will turn out a low grade until it is definitely known that all clean cotton has been harvested.

The official price is based upon the Liverpool price of American Middling 4 months ahead, plus an estimated premium for Uganda staple, minus profits and costs of ginning, transportation, tax, and other items connected with cotton from the time it leaves the hands of the grower until it is delivered at the overseas market. These items are what the Government and the gin associations think are fair to both grower and ginner. The Government appears to favor a liberal profit to the ginner. The price is computed by a Government officer who notifies each of the cotton ginning companies of the price they may pay for cotton on a fixed day. This price is usually fixed weekly but may be changed if the market fluctuations justify it.

UGANDA: Prices received by growers in cents per pound, for seed cotton, seasons 1928-29 to 1935-36

Season	Province				Average a/ all Uganda
	Buganda	Eastern	Northern	Western	
	Cents	Cents	Cents	Cents	Cents
1928-29..........	b/	b/	b/	b/	4.37
1929-30..........	3.55	b/	b/	b/	3.66
1930-31..........	2.79	b/	b/	b/	2.44
1931-32..........	1.82	1.95	1.78	1.00	1.88
1932-33..........	1.94	1.85	1.62	1.54	1.86
1933-34..........	2.85	2.42	2.10	2.12	2.55
1934-35..........	2.87	3.03	2.55	2.52	2.87
1935-36..........	2.44	2.38	2.04	2.22	2.36

Compiled from the official records of the Uganda Department of Agriculture, Entebbe, Uganda.
a/ Weighted average price.
b/ Not available.

Estimates are not available regarding the consumption of cotton in the homes of the natives. While some tribes spin cloth from the cotton they grow, most of the cotton materials used are imported by Indian traders. As soon as the people of a new district take up the growing of cotton, these traders, with a supply of European or Japanese manufactured goods, open trading posts in the district. There are no cotton manufacturing mills in East Africa, and it is doubtful if the Governments would look with favor upon the development of a local textile industry.

Cottonseed products are of little importance. Some efforts are being made to develop a cottonseed processing industry, but little headway has been made. In many cotton-growing districts the seed is burned as fuel in the gin. While this practice may seem expensive, it appears justified when the cost of transporting coal or oil is considered.

Exports are principally to India (Bombay), Japan, and the United Kingdom. During the early development of the industry, the United Kingdom took the major portion of the crop, but in recent years Japan and India have been important outlets. East African cotton, because of its staple length, is used in India for the manufacturing of high-count yarns. It replaces imports of raw cotton from the United States and Egypt, as well as imports of yarns of English manufacture.

Government Policy

There have been numerous references in this report to the interest of the East African Governments in the progress of cotton production. They are definitely committed to a program of encouraging the production of cotton and other crops that can be sold on a world market and thus pay an export tax. The export tax on cotton for a number of years has been an increasing item in Government revenue. License fees and various transport and handling charges on cotton also are sources of considerable income. The maintenance of the cotton acreage and the problems pertaining to the industry, therefore, are of special official concern. In Uganda, the income from cotton, either direct or indirect, forms the largest single revenue item. Throughout British East Africa, cotton is regarded as a leading factor in developing trade and commerce, since the increased interest in a cash crop has enabled the natives to acquire more European manufactured goods.

The experiment station facilities for the developing of varieties better adapted to local conditions, the study of insects and diseases, and other technical work connected with production have not kept pace with the increasing importance of the crop. In Kenya, little or no experimental work has been done on cotton breeding, though some attention is being given to insect and disease control. The Government of Kenya is now considering a proposal to develop cotton experiment stations in the areas where the crop appears to be well established. Some effort also has been made in Tanganyika to select higher-yielding varieties. The expenditures for cotton experimental work in both Kenya and Tanganyika, however, are exceeded by the budgets for the work in sisal, coffee, and other crops.

The three East African Governments, in cooperation with Zanzibar, maintain an experiment station known as the East African Agricultural Research Station, at Amani, Tanganyika. This station, established during the German occupation, is not located in the cotton territory and does no work directly associated with cotton, although some of its work on insects, diseases, and soil problems are of general interest to the cotton growing districts.

In addition to the money spent on the encouragement of the cotton industry by the various Governments, a considerable amount of capital has been invested in gins by British organizations interested in the promotion of cotton growing. These organizations also supplement the budget of the agricultural departments of the Governments. The funds, however, are not always limited to cotton experimental work. In areas where sleeping sickness has been stamped out, the people are resettled on the land by the Government. Some of the funds of these cotton-promotion associations have been used for this purpose, the theory being that the people who are resettled will take up the production of cotton.

The aims of the Government with respect to cotton production are carried out by officials designated as agricultural officers located in the various districts of the territories. These officers work in close cooperation with a district commissioner, who is in fact an administrative officer with duties corresponding to those of a governor. These commissioners have police powers and collect taxes. Under the agricultural officers are a number of native agricultural workers, some of whom have received a certain degree of training in the agriculture of the district in which they work.

The native officers oversee the distribution of cottonseed, check the plots planted, and with the local chief of the village supervise cultivating and harvesting of the cotton crop. The whole system of production is directly under Government supervision. The area is divided into small units and each native agricultural worker is held responsible by his superior officer for the crop in a particular district. The chiefs are also held responsible for the area of their tribes. The chief in turn holds the sub-chiefs to account for the smaller or village areas. The Governments decide upon the amount of planting seed required for the season, making requisition on the ginner, who is required to supply it free, and arrange for its distribution.

In some areas where cotton growing is new, it is customary for private cotton ginners to pay the salaries of a number of native agricultural workers who work under the supervision of the agricultural officer of the district. It has been found that without the supervision of the native agricultural workers the cotton acreage in the newer areas fluctuates sharply from year to year. The Governments are not willing to allow the natives to exercise full judgment as to the area to be cultivated or the time the crop is to be planted and harvested. These matters are determined by the agricultural officers and passed down through the native agricultural workers to the growers. The whole system is operated much like a big plantation: the Government is the owner; the agricultural workers are the overseers; and the natives are the croppers.

Outlook

The future of cotton production in East Africa, while dependent to some degree upon world conditions, will be influenced largely by local factors. The existence of a large unused area suitable for cotton growing favors an expansion of acreage. A large portion of East Africa is too high or too dry for cotton, but there are a number of areas where the elevation is low enough and climatic conditions are favorable for cotton growing. The potential labor supply is sufficient to indicate that a part of these areas can be brought under cultivation. Thousands of natives who are now engaged in growing only food crops may in the future be induced to plant cotton. The transportation system, while expensive, is sufficient to handle a reasonable increase in cotton shipments. A ready market for East African cotton abroad has contributed to the past increases and will no doubt continue to be an important factor.

The control of the local market by the Government has left the impression in the mind of the native that his interests are protected and that the price received is the best price obtainable. The absence of other cash crops in the area where cotton is grown is favorable to a greater expansion in cotton acreage. Increasing demand on the part of the native for manufactured commodities which must be imported also suggests that cotton acreage will increase. The variety of cotton now grown is reasonably well suited to soil and climatic conditions, and there is the possibility of developing a higher-yielding variety. The fact that East African cotton sells for a staple premium tends to give it an advantage in the matter of price.

The policy of the Governments regarding the cotton industry is a strong factor indicating a further expansion. With a large percentage of the revenue of the country depending upon the income from cotton, it is reasonable to expect that official effort will be made to maintain or increase the present area.

Offsetting the considerations pointing to an increased cotton acreage are a number of factors that may tend to retard the progress of the industry. Chief among these are transportation costs and losses from insects and disease. While the cost of growing cotton, from the standpoint of the native, is small, the total cost of ginning and inland and overseas transportation represents a considerable portion of the export price. These costs, some of which may fluctuate from year to year, on the whole probably will not be reduced much below present levels.

Losses resulting from insects and plant diseases are heavy; consequently, yields are generally low. In a tropical country such as East Africa, there is little doubt that insects will become more numerous as cotton acreage increases. Cotton is a comparatively new crop. In the oldest districts of Uganda it is scarcely more than 30 years since cotton production was started. In many districts of Kenya and Tanganyika, it has become established only in recent years. With climatic conditions as they are, it is reasonable to expect that the native farmer, if faced with increased losses from insects, will be greatly handicapped. Erosion also presents a serious problem.

The system of farming small plots with hand tools limits the amount of land that the native can cultivate. At present, he handles about an acre of cotton in addition to the area required for food. While general education is spreading, many of the people in the cotton-growing districts are still primitive in their outlook. They continue to live under their tribal governments headed by chiefs and sub-chiefs. Many of them care very little for the things that may be purchased from the trader. They prefer to live as they have always lived, raising their own food and occasionally selling a cow for cash to purchase the few necessities of their tribal existence.

Taking all factors into consideration, however, it would seem that the three territories of East Africa may be expected to increase their annual cotton acreage. The farmers may count on official encouragement for a considerable period, or at least until a larger revenue from other sources is forthcoming. It might even be possible to double the present production, but only after years of education and training of the natives and the general use of power tools. It is not likely that the future development will be more rapid than the past. East Africa may in the near future produce as much as 500,000 bales of 400 pounds annually. It may eventually produce 1,000,000 bales.

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LONG-RANGE WEATHER FORECASTING IN GERMANY

. . . . By Gordon P. Boals*

Long-range weather forecasting has occupied the interest of meteorologists for many years. The first use of such forecasts in a broad popular way has been developed in Germany. According to German reports, these forecasts have proved highly satisfactory. Experience over a much longer period of time will be necessary, however, before the methods used can be accepted without reserve. Furthermore, the forecasts cover conditions over a comparatively small area. Their application to the United States, for example, could be determined only after long trial. The German forecasts are not strictly long range because so far they are limited to 10-day periods. They are especially helpful to agriculturists in countries like Germany, however, because of the inclement weather that is frequently experienced at harvest time.

Long-range weather forecasting has reached a practical state in Germany, particularly with reference to agriculture. This is true with respect not only to the apparent accuracy of the present forecasts but also to the periodicity and timeliness of their issuance. One group of forecasts, now issued for 10-day periods during the summer months, when they are of special use and value to farmers, has achieved a degree of accuracy (according to local observers) comparable with the 1- to 2-day forecasts in most other countries. With increasing experience and technical facilities, the long-range weather forecasting activities of the German Weather Bureau are expected to be further extended, not only over a longer period but also in their scope and type.

The long-range weather forecasting activities in Germany have been featured by the work of Dr. Franz Baur. For many years he has given particular attention to long-range weather forecasting, developing the work first in a weather observatory and meteorological institute, then in an official state institute, later as head of a semiprivate institute for long-range weather forecasting, and for the past year as Director of the long-range weather forecasting section of the German

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Weather Bureau. His 10-day forecasts, which were first published in 1932, have shown steady improvement. The 10-day period is found to be a most practical one, as it permits considerable definiteness in the forecast and is, at the same time, a long enough period for use in arranging farm work and many other activities.

Methods Used in German Weather Research

There are three essentially different methods used in the scientific investigations of long-range weather forecasting in Germany. As the scope of the general subject of long-range weather forecasting is so great, including usually all forecasts covering 3 days and a great variety of climates and conditions, it can be readily understood that each of the methods may either contribute something useful or be necessary for certain types of forecasts. A fundamental problem in German research has been to determine which method would give the most practical and useful results, and in this decision agricultural needs have been of paramount importance.

The first method consists of solar observations with regard to fluctuations and activity, because the sun is the weather's main source of energy. If this source of energy shows regular changes in activity such as probably result, for example, from the rotation period of the sun or as is shown by the well-known 11-year period of sun spots, it is natural to look for similar periodical weather phenomena and, if possible, to utilize them for weather forecasting. Dr. Baur has clearly recognized this necessity and for a long time has been following the fluctuations in the activity of the sun by carrying out regular measurements of the sun's rays. It was thought that it would thus be possible to use such results in determining the character of the weather for 6 months or a whole year in advance. As these fluctuations are relatively very small, however, and as influences from the earth (such as volcanic eruptions, which cause a changing turbidity of the entire atmosphere) disturb the direct effects of such sun-ray fluctuations, it still requires long and very tedious experimental work and experience before positive results can be attained.

The second method of trying to penetrate into the reasons for fluctuating weather conditions consists of a very general search for regular periodical weather developments. Countless investigations have been made in this field, and the Geophysical Institute in Leipzig has adopted as its chief task this type of research work of periodical weather conditions. It is possible that such periodical weather conditions exist, and that in some parts of the world they may be used for weather forecasting.

However tempting the two foregoing methods for prophesying the weather may appear to be, the third method has grown in favor in Germany as possessing the greatest probability of success, particularly for the practical needs of agriculture, aviation, and the like. For determining the weather for a certain period in advance, this third method is based on a statistical calculation of weather relationships. In earlier days, the fundamental idea underlying this method was applied by an ecclesiastic named Kaltenbrunner, who based his work on the assumption that, given similar combinations in the distribution of air pressure and temperature (as they are registered in present-day weather charts), the resulting weather will be practically the same. This is not necessarily the case, however, because the conditions prevailing in the higher layers of the air are reflected in the behavior of certain meteorological elements and in their relations to each other in different places.

This method has been especially developed in recent years by Dr. Baur. He has used the simultaneous appearance of several such relationships or "multiple correlations" prevailing during a certain 10-day period and has brought them into relationship with the prospective weather for the following 10 days. For this purpose, he has sorted out a number of multiple correlations, which have all been filed and indexed. Thus, it is possible to obtain a sequel of weather charts that not only are very similar in the outward picture of the weather chart but also show the greatest similarity in the internal construction of the weather situation. The deduced weather developments based on these comparisons have now proved the correctness of this approach, at least for the short period for which they have been used.

The 10-day Forecasts

Development of the forecasts

The selection of the 10-day period came only after considerable research and investigation of weather data for long-range weather forecasts. The first activities were devoted largely to the making of a monthly forecast, particularly because much monthly meteorological data were already available. Monthly average data, however, proved too indefinite for the desired degree of accuracy; so daily observations became the basis of their work. An extraordinary increase in the amount of basic material to be collected naturally was required, especially as observations for a 40-year period (1893-1932) were used. Various groupings of these data were made, including the usual weekly period, but it was found that the 10-day period offered the greatest practical possibilities. Multiple correlations of features in the "fore" and "post" weather during the 10-day period were computed and charted for the 40-year period. This record of weather relationships provided an unusually useful background and partial basis for the new forecasts.

The first 10-day forecasts were published in the summer (July and August) of 1932. The summer period is the one during which there is the greatest demand and need in Germany for such forecasts because of agricultural activities and vacation plans. Normally there are intermittent rains or storms, which can interfere considerably with the important hay and grain harvests and other activities unless forecasts for several days ahead are available. It was found that the statistical work involved was too great for the small staff to consider making such forecasts throughout the year or even for 6 months. If any forecasts were to be issued, it would be necessary to confine them to a relatively short period.

This procedure reveals something of the scientific and careful nature of the approach to the problem. It was deemed better to start with four or five forecasts on the basis of the most extensive data available than to make them throughout the year with less adequate data, even though they were the only forecasts of this type being issued. Each year an effort has been made to extend the detailed statistical computations, charts, and other material to make possible forecasts for one or two additional 10-day periods.

In 1936 there were ten 10-day forecasts extending over the period from June 18 to August 29. They were issued each Wednesday evening and thus overlapped each other by 3 days. This overlapping was a new feature in 1936, because during the four previous seasons the forecasts were issued only at the expiration of the 10-day period to which the one before applied. Such a system, it was found, did not help farmers or others in making plans on the last day or two of the forecasts, so the overlapping was a very definite step forward in making them more useful and practical. It likewise provided an opportunity for rechecking weather developments, and more definite comments could be given about the weather near the end of the forecast period. In reality, of course, this means that the effective use of the forecasts is for one week only.

The 1937 schedule for the 10-day forecasts shows a marked extension of the period covered. Present plans call for the forecasts to be issued over a full 4-month period (June-September), or 6 weeks longer than in 1936. This longer period will cover practically all of the important agricultural harvesting season, including the first hay crop and most of the root crops, for which forecasts previously have not been available. In 1938, a further extension of 6 weeks to 2 months is planned, including particularly the important fruit-, grape-, and wine-harvest month of October. By the beginning of 1941, German weather officials hope that the 10-day forecasts can be made throughout the year. As in 1936, the forecasts will be released each Wednesday evening for the following 10-day period, since the overlapping feature has proved to be very useful and desirable.

There was a definite lack of publicity about the forecasts during the first 3 years of their issuance (1932-1934). This was considered the "proving period", and the development of practical experience and technique was desired before the new method was publicized. In 1932, the forecasts were given out to a considerable group of contacts, especially agricultural, in various parts of Germany and were published locally in a few cases. Although it was estimated that the forecasts were about 70 percent correct, it was decided in 1933 to make them available only to a limited circle of meteorological and agricultural persons, who would be able to act as critics. It was desired to increase the degree of accuracy and improve on technique in this new effort. In 1934 and 1935, the forecasts were published in the Frankfurter Zeitung and a few other papers. They were still largely on a private basis (less so in 1935), and those persons in other parts of Germany who were not definite contacts of Dr. Baur generally had to buy the forecast service if it was desired.

The past year, 1936 and to some extent 1935, may be called the public phase of the forecasts. The Reichsnährstand organization (in part comparable to the Agricultural Adjustment Administration in the United States) has pointed out the great value of the forecasts to agriculture, and they are now broadcast over the radio each Wednesday night throughout Germany. They are likewise carried in papers each week in all parts of the country. Feature articles about the 10-day forecasts and long-range weather forecasting have appeared in many papers.

Description and examples

The 10-day weather forecasts naturally can give only general information about the developments and changes in the weather, such as the type of rainfall over 0.1 mm expected, the number of rainy days or the number of hours of sunshine, changes in temperature, etc. It has been found, however, that important weather or atmospheric changes during the 10-day period can be forecast with great certainty, often to within a day of their occurrence. Thus, when supplemented by the ordinary daily weather reports, considerable detailed information is available for the German farmer and others interested, not only for the current day but also with regard to the general trend of the weather for many days in advance.

The following examples of the 10-day forecasts may serve to indicate their character and scope. It may be noted that in 1935 and 1936 somewhat more descriptive and detailed information was often given, largely as a result of increased experience and technique. It is not unlikely that there will be further developments year by year, although in general it is believed that the present reports are quite representative of the possibilities of this type of weather forecast.

1933, first forecast: (For period July 6 to 15.) "During the next few days the weather in West Germany will be warm to very warm, with fine clouds (on an average below 4/10), and for the most part dry. Gradually the fine weather will also stretch over to the east. Around the week end, adverse weather is again to be expected from the west, i.e., first in the west and then in the east, with increasing cloudiness. It will be sultry, with a tendency toward thunderstorms and rainfall, followed by unsettled and rainy, although not entirely unfriendly, weather. For most of Germany there will be about 4 to 6 days registering precipitation during the period covered by the forecast."

1934, fourth forecast: (For period July 21 to 30. This forecast was especially interesting at the time, because it predicted the first important rainfall in approximately 2 months.) "About 10 days ago a slight change in the general weather situation took place. A further change will now set in, with the general weather for Germany becoming more unfavorable. During the next 10 days we shall experience mainly polar and maritime air currents. Fairly unsettled and cool weather with a tendency toward rainfall will predominate.

"After many weeks of relatively great dryness, more frequent and partially even heavy precipitation is now to be expected. In between, however, the weather will sometimes clear up and in southwest Germany the fine weather may last for several days. The precipitation in north Germany during the 10-day period will generally be above normal. In contrast to the first two-thirds of the month, the temperatures during the last third of the month will be below normal for most of Germany."

1935, second forecast: (For period July 11 to 20.) "During the next 10 days the weather in the greater part of Germany will be predominantly warm, partly sultry, and in many cases clearing up, but in any case not disagreeable. A tendency prevails toward thunderstorms, which might cause extensive local precipitations. On the whole, however, the weather in south Germany (south of central German mountains; Taunus, Spessart, Rhon, Thüringer Wald), as well as west of the Rhine, will be slightly better than in the north and east, where weather conditions, particularly after the 13th, will show an uncertain character. The number of hours with sunshine will exceed 70 in south Germany as well as in north Germany west of the river Oder and in Silesia, i.e., the average daily sunshine period will amount to at least 7 hours."

1936, third forecast: (For period July 2 to 11.) "The weather during the next 3 or 4 days will be slightly uncertain in all of Germany, brightening-up periods interchanging with short ones with precipitation. Such rainfall will frequently be of a thunderstorm character, and in many locations it may be rather heavy. In general, though with changing temperatures, moderately warm weather will prevail. In East Prussia, at least during the next few days, more sunny and warmer weather is to be expected than in the rest of Germany. About the beginning of next week, bright and dry weather with rising temperatures is expected for several days in the whole of Germany. During the second half of next week somewhat uncertain weather will again set in. Beginning with occasional thunderstorms, there will be more frequent and stronger rainfalls, particularly in the Alpine districts. The sunshine period during the 10-day forecast will, in most locations range from 60 to 90 hours."

1936, ninth forecast: (For period August 13 to 22.) "The weather during the next 3 to 5 days will be fairly uncertain, but in most locations not overcast. In some places in the central German mountains, Silesia, the Black Forest, and the Alpine districts, greater rainfalls may be expected. In the eastern districts it will be relatively warm, while in the western and southwestern sections it will be predominantly cool. During the next week predominantly bright, dry, and, in daytime, warm weather will prevail. Near the end of the forecasting period, a tendency toward thunderstorms, particularly in the eastern districts, will be apparent."

Accuracy of forecasts

German weather and other officials maintain that the accuracy of the 10-day forecasts has now reached 80 to 90 percent, which slightly exceeds even that of daily forecasts.

General opinion regarding forecasts has never been considered a good criterion in Germany; so an objective examination has been regularly made. For many years the German Weather Bureau has requested more than 100 weather observers to compare every day the forecast with actual weather conditions. This has provided a wealth of material about actual weather conditions in all parts of Germany and has made it possible to check the accuracy of forecasts in a scientific manner.

The greatest number of weather observers are farmers, since it is of greatest importance for farmers to know what the weather will be for a few weeks in advance. For the European farmer, the result of his season's work often depends on the weather during harvest. As two observers are better than one, a second observer, as far as possible, is appointed in each place, usually a forester, teacher, or clergyman, but in any case not a farmer. Without knowing of each other, the two observers record in their "control books" every evening how the actual weather of the day has compared with the long-range weather forecasts. The books used are called "control books for confidential reporters of the Federal Weather Bureau for the examination of the 10-day weather forecast." Each book carries the name and profession of the observer, as well as the location and altitude of his place of observation. For each day there is one column for the markings from "entirely correct" to "entirely wrong", another for critical remarks about the weather, and a third for a record by the professional observers of weather conditions important for professional purposes which were not considered in the forecast. Much useful information and many suggestions are thus being obtained.

The conclusions show some surprising results. Five hundred observations made in west Germany during 1936 in connection with the forecasts showed 361 entirely correct, 85 substantially correct, 22 partly correct, 19 mainly incorrect, and 13 entirely wrong. Of 486 observations received from south Germany, 303 were rated as completely correct, 149 as substantially correct, and only 34 as "partly correct." Results are most favorable for west Germany, because of the fact that for certain German districts forecasting is easier than for others. The most difficult districts for weather forecasting are East Prussia and Silesia. In Silesia, the difficulties appear to arise from the mountainous character of the district, and in East Prussia they are caused by the transition from an oceanic to a continental climate. For the district from west Germany to the River Oder, the forecasts are nearly always correct, while farther east the correctness decreases somewhat.

For the 10 individual forecasts made during the 1936 summer season, the following results, expressed in percentages of correctness, were indicated by the weather "control data" collected:

	Germany west of Weichsel 1/ Percent	East Prussia Percent	Total Germany Percent
1. Forecast	98	85	96.8
2. "	57	18	53.7
3. "	90	98	90.7
4. "	98	78	96.2
5. "	93	92	92.9
6. "	96	92	95.6
7. "	49	57	49.7
8. "	77	95	78.6
9. "	91	91	91.0
10. "	97	80	95.5
Average	84.6	78.6	84.1

1/ A river in the so-called Polish Corridor (formerly German territory), which roughly separates Germany proper from East Prussia.

It may thus be seen that, except for the two forecasts which proved only about 50 percent correct, the degree of accuracy attained was remarkably high.

During the 5-year period 1932-1936 in which the 10-day forecasts have been issued, the seasonal results have been shown to be:

Year	Accuracy Percent
1932	70
1933	81
1934	80
1935	87
1936	84

Partly refelcted in this general upward trend of accuracy is the factor of experience, which Dr. Baur and others consider of paramount importance in longer-time forecasts.

Significance for agriculture

German agricultural leaders believe that daily weather forecasts are of only limited significance for agriculture, even if they have a high degree of accuracy. Likewise very long-time forecasts (for a year or longer) are believed to have only a limited practical use or meaning for farmers unless they contain much more detailed or definite information than now seems possible. Agricultural activities for which weather forecasts are most needed, at least in Central Europe, are the so-called "set jobs", notably harvesting. Such jobs usually cover a period of 2 days to a week or so; and if a piece of work has been started which requires 3 or 4 days or a week and rain sets in before it is finished, considerable damage often results.

German agricultural people therefore welcomed the 10-day weather forecasts. They were the most reliable intermediate long-time forecasts then issued, and they have been still further improved and extended over a longer period of the summer. A reasonable degree of accuracy and definiteness, along with prompt availability of such forecasts during the harvesting period at least, is the real test of their significance for agriculture.

The occasions for which farmers need most information with respect to weather developments are the harvest seasons for grains, roots, and the first and second hay crops. During these periods, great values are at stake, and the results of a whole year's work are exposed to the vagaries of the weather. The consequences of unfavorable weather conditions cannot be entirely removed, but they can be considerably alleviated in Germany by rearranging farm work, when the approach of bad weather is known. During the time of hay making in much of Central Europe, for example, the grass can be dried on the fields or on scaffolds. If dried on the fields, 2 days of sun are required, and the hay can be brought in during the third day. If rain falls in the midst of the hay harvest, the hay loses its color and some of its nourishment, and, if the rain continues, it rots on the ground. This happens, of course, because the farmer does not know that rain will come. If a change in the weather is expected, it is possible to shift the time of mowing somewhat or to dry the hay on scaffolds. In the latter case, the hay, either green or partly dry, is hung on scaffolds of various forms, where it can remain for weeks in the rain without losing too much of its nourishing value and without rotting. Drying on the fields, however, is advisable during good weather because it is the quickest method of making hay and requires the least labor.

It is apparent how significant the 10-day weather forecasts can be for farmers. With the forecasts as now given, together with their prompt and widespread dissemination, the overlapping feature, and the lengthening period of the year for which they are available, it may readily be seen that their significance for German agriculture is of considerable potential importance. This seems particularly true with respect to improving the quality, and to some extent the yields, of agricultural products in seasons of generally rainy and uncertain weather. In countries like Germany that have high average yields of certain crops, especially grain and root crops, and are unable to import freely on account of foreign exchange difficulties, the significance of such forecasts may be said to have even greater possibilities, not only for agriculture but for the national economy as well.

Monthly and Seasonal Forecasts

In addition to the 10-day forecasts, Dr. Baur and his Institute have been carrying on work, particularly during the past 3 or 4 years, with respect to monthly, seasonal, and annual forecasts. It is indicated that these have led so far to satisfactory results, and considerable expectations appear to be justified for such forecasts. The forecasts are not published but are passed on to Government, economic, and scientific institutions for examination and use. As far as the monthly forecasts are concerned, 88 percent are indicated to have proved reliable with respect to temperature and 75 percent with respect to precipitation. The seasonal forecasts (roughly for 3 months) that have been made and about which something is known, also reveal considerable possibilities.

It appears that increasingly good results are being obtained for monthly and seasonal forecasts as well as for 10-day forecasts in Germany. Research has been proceeding step by step in a logical way, and without doubt has advanced further than is generally known. This is particularly true as regards the development of what might be termed "practical" long-range weather forecasts, especially where it pertains to experience and technique.

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THE AUSTRIAN HOG INDUSTRY AND THE MARKET FOR AMERICAN LARD . . . .

. . . . By Harry E. Reed*

In pre-war years Austria depended heavily upon the eastern regions of the Dual Monarchy for food supplies, including pork and lard. During the immediate post-war years, however, it became increasingly difficult to obtain pork and lard requirements from these nearby areas. Austria turned to the United States, therefore, as the world's leading exporter of these products and by 1925 ranked as one of the more important continental buyers of lard from the United States. In more recent years a tendency to return to the general pre-war trade relations with adjacent countries has been in evidence. This, together with the recent shortage and consequent higher prices of American lard, has resulted in almost stopping the sales of that product to Austria. Since the production of lard in nearby Danubian countries has definite limitations, Austria is following the pre-war policy of importing live hogs, thereby obtaining both pork and lard. Should this policy continue, there is little likelihood of a return to the trade in American lard which prevailed in the first post-war decade.

Austria, one of the deficit meat and fat countries of Central Europe, obtains most of its imported pork and fat supplies in the form of live hogs from neighboring countries. During the post-war period, while European hog herds were being replenished and sufficient numbers could not be imported, Austria became an important market for American lard. At present, however, the foreign trade policy followed by the Austrian Government makes the importation of American lard impossible except during periods of fat shortages. The development of Austria's trade policy, particularly as it affects American lard, has come with the need for export outlets for Austrian industrial goods.

For a few years, beginning in the late 1920's, Austria sought to become less dependent on live hog imports and greatly increased domestic hog production. The expansion in domestic production more than offset the reduction in imports, and total pork supplies increased. Exports of industrial goods, however, suffered when hog imports were reduced, and the greater consumption of pork, together with declining pork prices, depressed the domestic beef market.

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Austria was the first of the deficit fat countries to expand hog production on the basis of imported feeds. It also was the first to abandon such a program in favor of importing needed pork and fats and securing in return an export outlet for those goods which Austria can produce efficiently. Measures have been adopted which have reduced domestic hog production, and, under terms of trade agreements with Poland and countries in the Danube Basin, most of the imported pork and fat supplies are received in the form of live hogs.

This development was simply a return to the trade channels followed in pre-war times when the territory comprising present-day Austria obtained hogs from the corn-producing sections of Austria-Hungary and supplied those sections with industrial goods. Austria's exports of industrial goods have increased with the larger imports of hogs, but other difficulties have arisen. Recently it has become evident that with domestic production, which is almost entirely of meat hogs, maintained at present levels and the remaining pork and fat requirements imported in the form of live hogs, pork surpluses occur.

Pork surpluses depress not only the domestic hog market but also the beef market. The cattle industry, which is the most important phase of Austrian agriculture, is in a difficult situation as a result of this and other causes, and presents the outstanding current agricultural problem. The surplus pork difficulty might be largely corrected by importing hogs up to a number which would not result in a pork surplus and meeting the remaining lard requirements by importing lard.

Agricultural Production Limited

Austria is primarily an industrial country. About two-thirds of the people are employed in nonagricultural pursuits, and approximately three-fourths of the national income is derived from industries other than agriculture and forestry. Agricultural production is limited by the topography of the country, much of the total area of 20,756,000 acres being mountainous, in forests, or otherwise unsuited for cultivation, and the country's food requirements cannot be supplied entirely from the domestic production.

Agriculture has, of necessity, undergone considerable expansion during the post-war period, and since the economic crisis developed in 1930 the interests of agriculture have been given increased consideration by Austrian governments, as they have in other countries. While greater production of certain products has been encouraged, there has been no attempt to attain full self-sufficiency, and the limitations of Austrian agriculture have been recognized. It is estimated that domestic production at present provides at least two-thirds of the grain, about four-fifths of the meat, slightly more than half of the fat, and most of the fruit and vegetable requirements.

The territory comprising present-day Austria has always been a deficit meat and fat area. Austria is not a natural hog-producing country, domestic production of fattening feedstuffs is small, and it is necessary to import feeds, hogs, and fat cattle. Domestically grown feeds, however, are well adapted to dairy and feeder cattle production, and the country produces a surplus of dairy and feeder cattle, butter and cheese. The fat shortage occurs in lard and raw materials for margarine production.

Pre-war dependence on nearby surplus areas

Prior to the war, Austrian agriculture was relatively undeveloped, except in the most arable and fertile sections. Austria supplied the agricultural sections of the Dual Monarchy with manufactured goods and obtained meat and fat supplies, largely in the form of live hogs, from Galicia and the corn-producing areas of the Danube Basin. These hog supplies, however, were not always sufficient to meet the demands of the industrial areas.

Frequent crop failures and seasonal shortages made it necessary occasionally to import both meats and lard from Western Hemisphere countries. At times, large imports of American lard were made, and on one occasion several shiploads of frozen beef were obtained from South America. In the absence of tariffs and other impediments, however, trade between the agricultural and industrial areas of the monarchy flourished, and the business of supplying the meat and fat requirements of Vienna and other industrial centers occupied an important place in the Hungarian economy.[1] The peace treaties, which split up the Empire and left Austria as an uneconomic unit, put an end to the free flow of trade between Austria and Hungary.

Post-war expansion

During the reconstruction period following the war, Austria found it difficult, and at times impossible, to obtain pork and fat from the former sources of supply. Embargoes placed on the export of hogs and pork products while herds were being replenished made it necessary to obtain supplies elsewhere. American lard imports into Austria greatly increased, the peak being reached in 1925. As European hog production increased, the practice of importing live hogs and processing them in Austrian plants was resumed. A growing consumer preference for pork from meat hogs was in evidence during this period, and meat-hog imports from Poland increased more rapidly than lard-hog imports from the Danube Basin.

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[1] See "The Hungarian Hog and Pork Industry" by H. E. Reed, published in "Foreign Crops and Markets", November 11, 1935.

Austrian imports of lard, by countries, 1925-1936

Year	United States	Hungary	Netherlands	Total
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds
1925	36,973	3,293	1,158	47,421
1926	12,530	5,087	416	20,985
1927	20,497	1,970	1,270	27,474
1928	27,066	476	2,325	30,839
1929	36,337	178	1,590	39,036
1930	20,828	795	316	22,334
1931	12,716	4,291	980	18,493
1932	10,037	190	703	11,339
1933	6,334	-	118	6,668
1934	915	-	-	916
1935	190	-	-	235
1936	220	-	-	569

1925 to 1932 from trade sources; 1933 to 1936, official Austrian trade figures.

Austrian imports of live hogs, by countries, 1925-1936

Year	Poland	Hungary	Yugoslavia	Total
	Thousands	Thousands	Thousands	Thousands
1925	559	81	45	806
1926	407	114	227	903
1927	356	64	254	834
1928	612	49	132	923
1929	416	151	152	772
1930	336	142	191	737
1931	329	96	181	738
1932	158	103	188	558
1933	79	126	133	417
1934	113	104	130	405
1935	127	146	145	497
1936	128	100	160	499

Official Austrian trade figures.

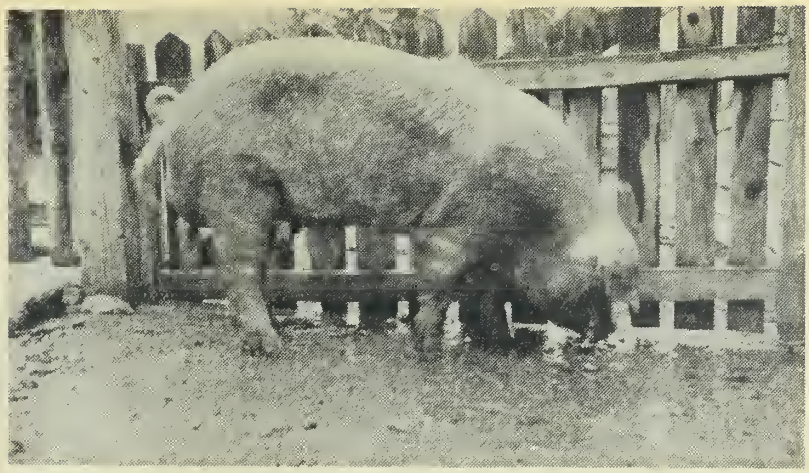

FIGURE 1 - VEREDELTE LANDSCHWEIN BOAR, TYROL.

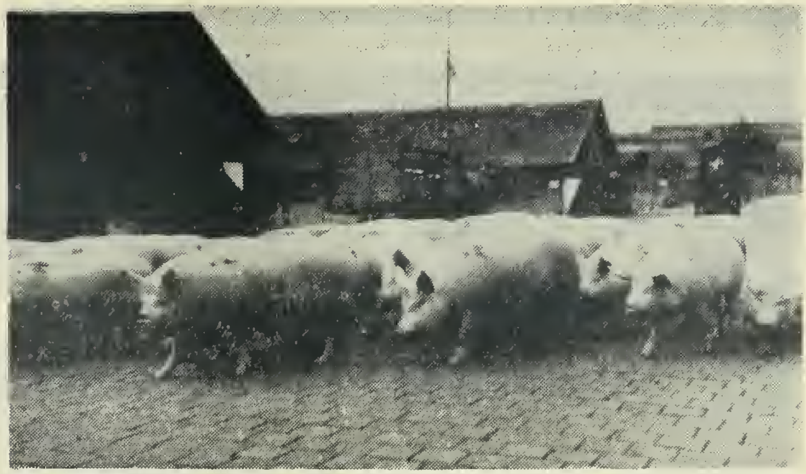

FIGURE 2 - GOOD AUSTRIAN MEAT-TYPE HOGS AT ST. MARX, VIENNA.

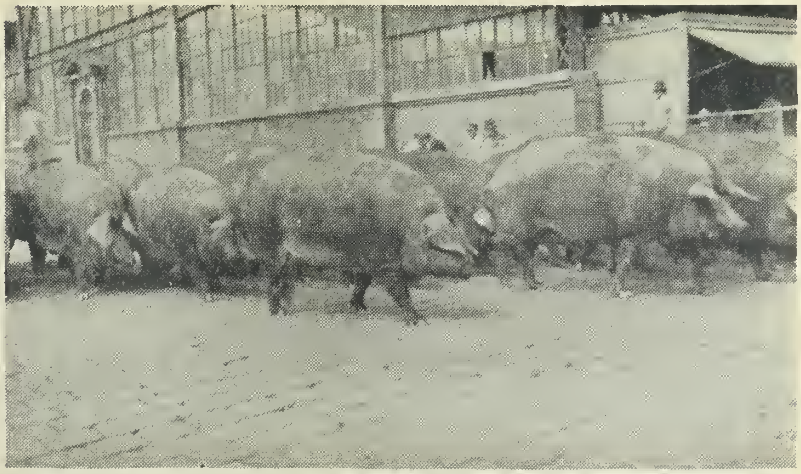

FIGURE 3 - YUGOSLAV LARD HOGS AT ST. MARX, VIENNA.

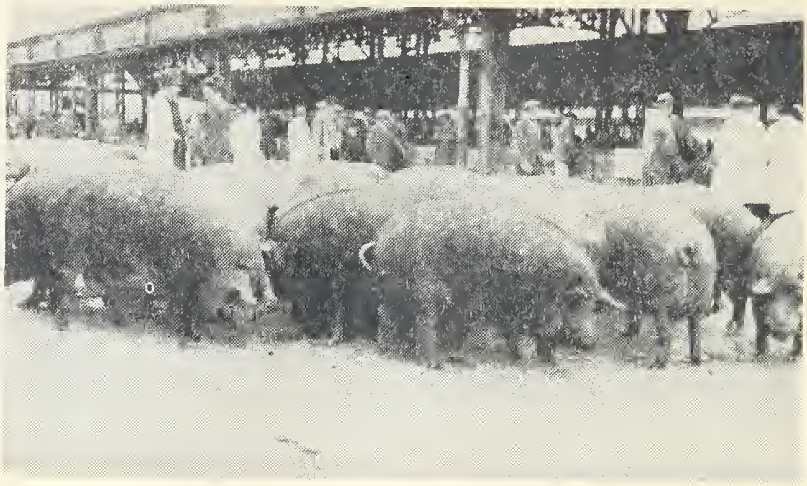

Figure 4 - Hungarian Berkshire-Mangolica crossbreds.

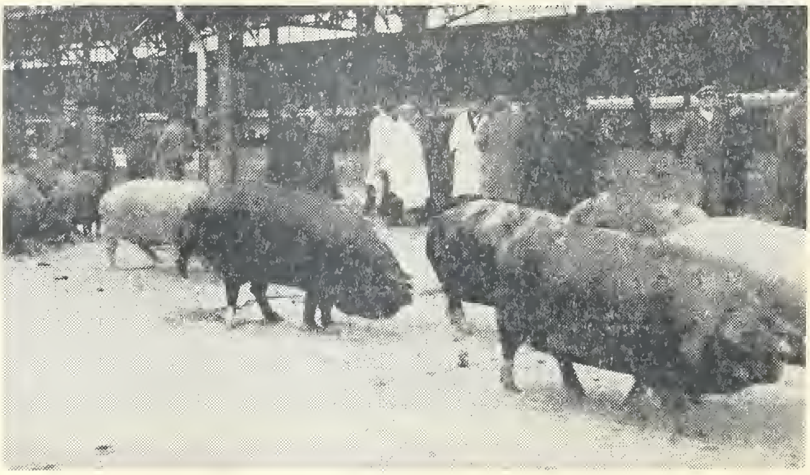

Figure 5 - Yugoslav crossbreds at Vienna.

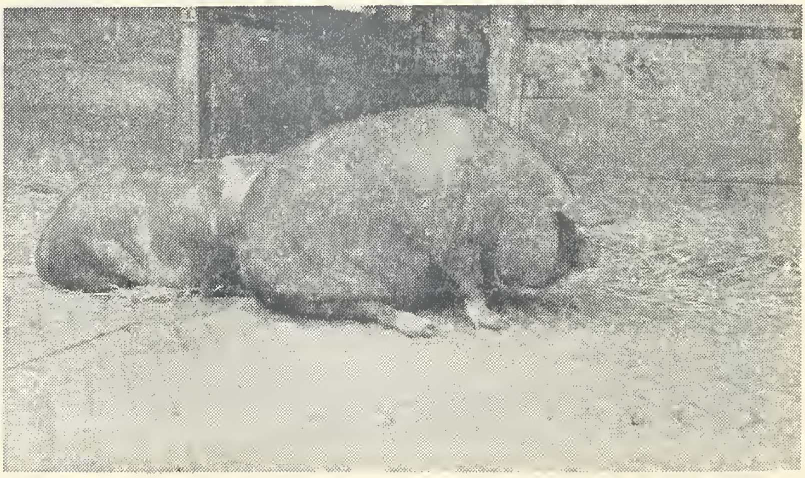

Figure 6 - Meat hogs fed to lard weight sometimes break down.

American lard, imported largely in the form of Prime Steam and used for mixing by Austrian refiners, was very much in favor, and imports continued at a relatively high level despite the increasing imports of live hogs. Annual lard imports fluctuated considerably after 1925, but were never so high as in the years of reduced hog imports. During the period 1925-1929, the United States supplied more than 80 percent of the Austrian lard imports, while Poland supplied more than half of the imports of live hogs and pork products. Live-hog imports reached a peak in 1928.

The Hog Industry

Hog numbers

Hog production in Austria is not based on domestic feed production, nor is it closely related to any one phase of agriculture. Consequently, and in view of Austria's industrial organization and economic situation, a greatly increased hog production does not appear to make for a well-balanced agriculture nor to be in the best interests of the national economy. With the encouragement given by the Government measures, however, particularly the duty-free import of cheap grains and the protection afforded by tariffs and quotas on hog imports, hog numbers increased. Census data show hog numbers on specified dates to have been as follows:

December 31, 1920 - 1,325,929
March 7, 1923 - 1,473,112
June 14, 1930 - 1,965,367
March 22, 1934 - 2,822,966

Types and distribution

Austrian hog production has been directed almost entirely toward production of meat-type hogs, and fat-hog production even in the period of cheap grain supplies has been of minor importance. German breeds, the Veredelte Landschwein (see figure 1) and the Edelschwein, predominate, the former in mountainous areas where their hardiness and ability to utilize available feeds stand them in favor and the latter in the more fertile areas where conditions are not so severe and where concentrated feeds are more plentiful. There are a few large Whites, the popularity of which is growing, and a few Berkshires. Other breeds are not important. A marked improvement in the quality of Austrian hogs has occurred during the period of expansion, but even so, uniformity in hogs for breeding and for market is lacking.

Production is centered in lower Austria and the arable sections of Upper Austria and Styria. In those areas, domestically produced feeds suitable for hog production are more plentiful than in other sections, better transportation is available for both feedstuffs and hogs, and the territory is within easy reach of the principal consuming centers. In the mountainous and more sparsely populated regions, hog production is usually for supplying local demand, but during the period of greatly increased production, supplies exceeded local requirements, and surplus and distribution problems developed in those areas.

Management and feeding practices

Approximately 96 percent of the total number of farms are less than 50 hectares (124 acres) in size, and the average size of holdings under 50 but above 2 hectares is about 11.5 hectares (28.4 acres). Consequently, the unit of hog production is small, and the 4,000 farms, which report hog numbers for the Production Tendency Census, average about 17 hogs, including 2.6 brood sows, per farm. Hog production was formerly conducted largely on small- and medium-sized farms and based on home-grown feeds supplemented with purchased concentrates. When favorable conditions for an increased hog production resulted from Government measures, however, the large estates became more interested, commercial feed lots developed, and a considerable expansion on the basis of imported feedstuffs took place. In fact, so many newcomers entered the hog business that many operations were carried on in an inefficient and unsatisfactory manner.

The general practice on the better-managed farms, especially in the important producing sections, is to follow a two-litter system, farrowings coming in the spring and fall. The heaviest hogs, which are carried through the summer, are finished quickly on early grains, but most fattening operations are conducted in the late fall and winter months after domestic crops have been harvested and imports of new-crop grain from the Danube Basin have arrived. These practices are in evidence in the Production Tendency Census data and also in data relating to monthly marketings of domestic hogs at Vienna. See table, page 269.

Prior to the great increase in hog numbers, domestic feed production satisfied most of the hog-feed requirements, but beginning with 1931 the expansion in hog production necessitated marked increases in imports of feeds suitable for hogs. Barley, imported corn, unmarketable potatoes, and, in certain cases, mangel beets are the principal feeds used for hogs. Dairy by-products, mill feeds, and imported fish meal, and oilseed and meat meals make up the nitrogenous part of the rations where fattening operations are extensive, but the relatively small unit of production on the majority of farms permits grass, kitchen garbage, and other home-produced feeds to be used to a large extent in meeting protein requirements. Market hogs are usually fed to about 80 kilograms (176 pounds) live weight. At this weight, a hog-feed price ratio of about 6 : 1 at the farm is considered necessary in order to "break even." See figure 2.

Marketing

Until recent years, hog production was chiefly for the purpose of supplying farm families with pork. The number marketed by any one farmer, or the total marketed in any one village, was too small to justify their shipment as live hogs to the principal consuming centers. Butchers and traders followed the practice of shipping the surplus as dressed hogs, and as late as 1930 dressed hogs accounted for 82 percent of the receipts of domestic hogs at Vienna. The great increase in domestic production made it necessary to establish a more efficient marketing system. This was accomplished with the assistance of the Government and the cooperation of the several Chambers of Agriculture, markets for live hogs and assembly stations being established where needed to handle the increased domestic production. With the improved facilities for handling and transporting live hogs, marketing methods changed, and in 1934, the peak year of domestic supplies, 88 percent of the domestic receipts at Vienna were in the form of live hogs.

Large markets now are maintained at all important consuming centers, the principal ones being at Vienna, Graz, Linz, Salzburg, and Innsbruck. Vienna, with a population of approximately 2,000,000, nearly a third of the Austrian population, handles the bulk of all hogs marketed in Austria. It has been estimated that during 1933, 1934, and 1935 approximately half of the hogs produced in Austria were marketed, and that about two-thirds of those marketed were handled in Vienna. Data relating to marketings at Vienna show that the proportion represented by domestic hogs increased from less than 10 percent in 1929 to about 54 percent in 1934. The seasonal tendency in domestic marketings is for receipts to increase during the late winter and early spring months, decline during the summer, increase slightly in the autumn, and decline again during the early winter. Prices tend to rise to a seasonal peak during the summer months when receipts are seasonally low.

Monthly marketings of hogs (live and dressed) at Vienna

Year and month	Domestic			Foreign			Total
	Fat	Lean	Total	Fat	Lean	Total	
	Number	Number	Number	Number	Number	Number	Number
1929							
January..........	283	4,821	5,104	17,190	50,992	68,182	73,286
February.........	419	6,909	7,328	14,009	35,117	49,126	56,454
March............	249	7,807	8,056	7,857	41,276	49,133	57,189
April............	514	10,928	11,442	10,931	46,659	57,590	69,032
May..............	329	8,364	8,693	8,917	38,633	47,550	56,243
June.............	195	4,459	4,654	8,722	41,405	50,127	54,781
July.............	286	4,078	4,364	11,159	55,776	66,935	71,299
August...........	214	2,611	2,825	12,455	42,616	55,071	57,896
September........	239	3,145	3,384	16,077	41,133	57,210	60,594
October..........	333	4,716	5,049	32,765	39,434	72,249	77,298
November.........	305	3,684	3,989	26,747	27,603	54,350	58,339
December.........	338	4,214	4,552	30,136	31,043	61,179	65,731
Total	3,704	65,736	69,440	196,965	491,737	688,702	758,142

Continued ~

Monthly marketings of hogs (live and dressed) at Vienna, cont'd

Year and month	Domestic			Foreign			Total
	Fat	Lean	Total	Fat	Lean	Total	
	Number	Number	Number	Number	Number	Number	Number
1930							
January........	181	6,251	6,432	25,181	31,058	56,239	62,671
February.......	233	5,833	6,066	14,109	31,954	46,063	52,129
March..........	187	8,742	8,929	11,511	28,681	40,192	49,121
April..........	425	13,710	14,135	16,252	32,653	48,905	63,040
May............	259	8,676	8,935	13,125	36,863	49,988	58,923
June...........	191	7,546	7,737	14,840	38,987	53,827	61,564
July	141	6,714	6,855	17,230	45,343	62,573	69,428
August.........	130	4,824	4,954	15,910	36,523	52,433	57,387
September......	266	7,367	7,633	23,598	47,846	71,444	79,077
October........	184	7,397	7,581	18,967	36,096	55,063	62,644
November.......	207	6,765	6,972	20,733	39,835	60,568	67,540
December.......	282	12,833	13,115	21,664	50,795	72,459	85,574
Total..........	2,686	96,658	99,344	213,130	456,634	669,754	769,098
1931							
January........	243	8,429	8,672	10,707	46,917	57,624	66,296
February.......	182	16,103	16,285	10,635	40,255	50,890	67,175
March..........	216	26,778	26,994	10,330	45,006	55,386	82,380
April..........	163	26,540	26,703	7,692	39,961	47,653	74,356
May............	135	29,734	29,869	6,748	47,063	53,811	83,680
June...........	261	28,372	28,633	6,659	49,397	56,056	84,689
July...........	137	26,461	26,598	12,720	59,852	72,572	99,170
August.........	166	14,815	14,981	14,988	34,153	49,141	64,122
September......	421	21,145	21,566	28,936	34,053	62,989	84,555
October.	197	17,863	18,060	27,134	25,472	52,606	70,666
November.......	134	13,104	13,238	27,792	30,233	58,025	71,263
December.......	286	33,357	33,643	24,606	16,756	41,362	75,005
Total........	2,541	262,701	265,242	188,997	469,118	658,115	923,357
1932							
January........	126	28,225	28,351	17,986	9,982	27,968	56,319
February.......	117	30,210	30,327	20,127	9,827	29,954	60,281
March..........	137	34,898	35,035	25,009	12,111	37,120	72,155
April..........	119	28,017	28,136	18,385	10,300	28,685	56,821
May............	238	37,057	37,295	26,094	11,262	37,356	74,651
June...........	159	24,606	24,765	21,319	10,338	31,657	56,422
July...........	193	16,436	16,629	20,687	18,507	39,194	55,823
August.........	218	14,426	14,644	28,524	28,273	56,797	71,441
September......	223	10,860	11,083	26,072	23,937	50,009	61,092
October........	234	13,646	13,880	37,713	27,785	65,498	79,378
November.......	197	11,123	11,325	28,214	17,788	46,002	57,327
December.......	209	18,513	18,722	27,033	13,394	40,427	59,149
Total.......	2,170	268,022	270,192	297,163	193,504	490,667	760,859

Continued -

Austrian Hog Industry

Monthly marketings of hogs (live and dressed) at Vienna, cont'd

Year and month	Domestic			Foreign			Total
	Fat	Lean	Total	Fat	Lean	Total	
	Number	Number	Number	Number	Number	Number	Number
1933							
January.........	180	20,311	20,491	33,503	13,665	47,168	67,659
February........	175	19,300	19,475	26,166	10,058	36,224	55,699
March...........	187	25,520	25,707	22,897	6,784	29,681	55,388
April...........	97	28,592	28,689	19,342	6,203	25,545	54,234
May.............	453	44,671	45,124	17,638	4,702	22,340	67,464
June............	93	26,202	26,295	20,268	7,967	28,235	54,530
July............	92	21,393	21,485	21,884	11,008	32,892	54,377
August..........	111	29,869	29,980	28,665	11,365	40,030	70,010
September.......	102	24,215	24,317	24,939	11,002	35,941	60,258
October.........	341	27,982	28,323	32,549	13,714	46,263	74,586
November........	1,210	29,370	30,580	29,383	13,559	42,942	73,522
December........	123	27,521	27,644	19,096	9,836	28,932	56,576
Total.........	3,164	324,946	328,110	296,330	119,863	416,193	744,303
1934							
January.........	138	33,345	33,483	23,772	12,792	36,564	70,047
February........	130	29,559	29,689	16,034	10,153	26,187	55,876
March...........	106	30,702	30,808	15,843	9,886	25,729	56,537
April...........	197	59,879	60,076	16,830	12,142	28,972	89,048
May.............	95	37,876	37,971	14,481	9,036	23,517	61,488
June............	147	40,323	40,470	12,313	9,264	21,577	62,047
July............	133	41,424	41,557	22,459	10,612	33,071	74,628
August..........	97	27,605	27,702	16,348	9,710	26,058	53,760
September.......	133	27,912	28,045	19,719	8,952	28,671	56,716
October.........	85	35,141	35,226	24,094	12,130	36,224	71,450
November........	59	26,448	26,507	19,426	10,390	29,816	56,323
December........	76	30,080	30,156	18,217	12,026	30,243	60,399
Total.........	1,396	420,294	421,690	219,536	127,093	346,629	768,319
1935							
January.........	64	32,374	32,438	21,973	15,819	37,792	70,230
February........	67	28,357	28,424	17,464	11,380	28,844	57,268
March...........	75	28,777	28,852	16,465	10,997	27,462	56,314
April...........	86	34,997	35,083	20,808	13,455	34,263	69,346
May.............	68	25,324	25,392	18,552	10,889	29,441	54,833
June............	48	21,856	21,904	18,433	15,169	33,602	55,506
July............	59	20,075	20,134	24,212	17,148	41,360	61,494
August..........	47	12,616	12,663	21,668	15,419	37,087	49,750
September.......	46	10,751	10,797	21,768	15,899	37,667	48,464
October.........	143	14,592	14,735	31,540	20,010	51,550	66,285
November........	117	11,941	12,058	20,520	15,440	35,960	48,018
December........	59	17,178	17,237	23,764	19,922	43,686	60,923
Total.........	879	258,838	259,717	257,167	181,547	438,714	698,431

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Monthly marketings of hogs (live and dressed) at Vienna, cont'd

Year and month	Domestic			Foreign			Total
	Fat	Lean	Total	Fat	Lean	Total	
	Number	Number	Number	Number	Number	Number	Number
1936							
January........	124	11,441	11,565	19,240	15,163	34,403	45,968
February.......	52	13,251	13,303	20,505	13,858	34,363	47,666
March..........	52	22,512	22,564	25,673	15,424	41,097	63,661
April..........	45	17,660	17,705	18,359	11,039	29,398	47,103
May............	139	18,874	19,013	19,021	11,788	30,809	49,822
June...........	221	21,875	22,096	22,281	15,769	38,050	60,146
July...........	246	13,807	14,053	19,578	12,642	32,220	46,273
August.........	282	11,507	11,789	23,255	13,067	36,322	48,111
September......	446	14,827	15,273	29,600	14,670	44,270	59,543
October........	218	12,804	13,022	23,549	12,771	36,320	49,342
November.......	221	12,030	12,251	22,715	12,066	34,781	47,032
December.......	545	20,808	21,353	24,580	12,883	37,463	58,816
Total........	2,591	191,396	193,987	268,356	161,140	429,496	623,483

Compiled from data furnished by American Consulate General, Vienna.

Processing

Municipal abattoirs are maintained at all important markets, where wholesale slaughterers and butchers may, on payment of prescribed fees, make use of the facilities provided by the municipalities. The Austrian packing industry is centered around Vienna, and several large plants are in operation. Processing is well developed, and utilization of by-products appears to have been perfected to a greater degree than in any other European country, with the possible exception of Germany. A strict and thorough veterinary inspection is maintained at the abattoirs and packing plants.

Pork and fat consumption

Data relating to consumption over the whole of Austria are not available, but meat consumption statistics for Vienna, based on the quantity of meat consigned to the central market, show that prior to 1930 beef was the most important meat in the Viennese diet. See table, page 273. Since 1930, with the increase in domestic hog production and a shift toward dairy production in the cattle industry, pork has become the most important meat in Vienna, accounting for 59 percent of the total meat consumption in 1933 compared with only 35 percent 5 years earlier. In the rural sections, home slaughter of beef and veal is of minor importance and per-capita pork consumption is considerably higher than in the cities. Domestic production provides about three-fourths of the country's total pork consumption at present.

AUSTRIA: Average per-capita consumption of meats in Vienna, 1923-1933

Year	Beef	Veal	Pork	Smoked meat	Total
	Pounds	Pounds	Pounds	Pounds	Pounds
1923	37.5	.04	13.0	1.1	51.6
1924	35.7	.18	15.2	1.5	52.6
1925	32.4	.51	20.1	1.8	54.8
1926	34.8	.46	28.9	2.0	66.2
1927	30.9	.49	28.2	2.0	61.6
1928	32.6	.51	19.8	2.2	55.1
1929	30.9	.46	21.8	2.0	55.2
1930	28.4	.37	28.4	1.8	59.0
1931	26.2	.33	27.5	2.0	56.0
1932	23.8	.29	30.1	1.8	56.0
1933	21.2	.22	33.4	1.8	56.6

-International Institute of Agriculture, Rome. Based on the quantities of meat consigned to the Vienna Central Market.

Data relating to fat supplies and consumption are even scarcer than those relating to meats. It has been estimated that in 1935, Austrian production of butter approximated 24,000 short tons, of which about 2,200 tons were exported; lard production, an appreciable part of which was derived from imported hogs, was about 79,000 tons; and margarine production, for which 90 percent of the raw materials are imported, was about 17,600 tons. On the basis of these estimates total fat consumption was approximately 118,000 tons, or about 34.2 pounds per capita. Domestic production was estimated to have provided about 55 percent of the total fat supply in 1935.

Policy Changes Cause Production Shifts

Measures to increase domestic hog production

As early as 1936, measures were adopted by the Government to increase domestic hog production and make the country less dependent on imported supplies. Duty-free import of feedstuffs, duty-free import of breeding stock from certain countries, Government assistance in the purchase of breeding animals, and protection in the form of a tariff on imported slaughter hogs were the principal methods used at first to encourage domestic hog production. Despite the resulting increase in domestic supplies and the tariff on imported hogs, shipments of foreign hogs to Vienna continued at high levels.

In 1931, prices became so low that the Government found it necessary to resort to market-supporting purchases. The objective was to remove surplus domestic hogs from the market and to use them for the unemployed, but lack of funds stopped this program. In order to reduce market receipts, a system of import quotas for live hogs was introduced. Later, as the economic and agrarian crisis developed, additional measures were adopted. These included higher tariffs for hogs and lard, establishment of a more efficient marketing system, outright cash subsidies to producers in special cases, equalization of freight rates, and regulation of domestic and foreign receipts at the markets.

Economic consequences of increased domestic hog production

The great increase in domestic hog production, together with the protective measures adopted by the Government, resulted in imports of live hogs falling from 923,000 in 1928 to 405,000 in 1934. See table, page 266. It also necessitated a marked increase in imports of feeds, which rose from 380,000 short tons in 1928 to 873,000 tons in 1934. The increase, however, did not, nor was it intended to, make it unnecessary to import hogs and hog products. Imports of hogs, pork, and lard continued at a reduced level.

The most important, and at the same time most undesirable, results of the increase in domestic hog production were the effects which the increase had on the domestic cattle industry and on Austrian foreign trade. Export outlets for feeder and breeding cattle contracted during the depression, and domestic consumption of beef declined as pork consumption increased. The declining tendency in hog and pork prices and the reduced demand for beef had a decidedly unfavorable effect on the cattle industry. The expansion in hog production on the basis of imported feeds increased pork consumption at the expense of beef consumption, thereby depressing the cattle industry, for which Austrian feeds are satisfactory, and resulted in a lack of balance in the livestock industry and in the agricultural economy.

Austria's natural outlets for manufactured goods are the Danube countries and Poland. Increased feed imports from those countries, however, did not offset the reduction in live-hog imports. Since the Austrian trade with those countries had been more or less reduced to barter, clearing, compensation, or similar arrangements, Austrian exports declined accordingly. Austria's industrial plant had been built up to supply a larger market than the post-war population of the country could offer and it was necessary to accept imported hogs in order to secure a market for industrial goods.

Cattle are of outstanding importance in the Austrian agricultural economy. In the arable sections, milk production is the principal aim, while in the mountainous sections the production of breeding and feeder cattle is of most importance. Farmers in the fertile and arable sections, adjacent to markets and benefited by protective measures, are enjoying fairly satisfactory conditions, but the mountain farmers, dependent almost wholly on timber and cattle for their livelihood and handicapped by restricted export and domestic outlets for feeder cattle, poor transportation facilities, and a depressed timber market, are operating under very adverse conditions. In fact, the situation as it affects mountain farmers has become the most pressing and most important agricultural problem in Austria, and considerable attention is being given to the aid of this group. Notable among the measures adopted for the aid of the mountain cattle industry has been the recent requirement that sugar-beet producers who produce more than 200 metric tons (220 short tons) of beets annually must keep (presumably fatten) a certain number of cattle for each 50, 40, or 30 tons of beets produced, the latter figures varying with the total quantity produced on the farms.

Measures to reduce and rationalize hog production

As a first step toward a more satisfactory balance between Austrian hog numbers and domestic feed supplies, "commercial" fattening of hogs was prohibited in late 1933, and on individual farms where hog numbers exceeded 100, fattening could be conducted only under a license obtained from the Ministry of Agriculture. The most important measure for reducing production was the adoption of feed-grain import license fees, which were raised by successive steps to 9 schillings per 100 kilograms (77 cents per 100 pounds) by July 1935.

Census data for all Austria are not available, but the Production Tendency Census shows that hog numbers declined until about the middle of 1935, after which fluctuations in numbers have been no more than seasonal. At present levels, Austrian hog numbers are regarded by the authorities as being satisfactory. Large profits on feeding hogs on imported grains are no longer obtainable, and during the summer of 1936 the general opinion of farmers was that those who were producing their own feeds were making a reasonable profit, whereas those who were dependent on purchased feeds were incurring losses.

In order to protect further the live-hog market, the authorities imposed, in July 1933, an embargo on the import of provisions. Imports of American lard, which had declined sharply after the lard tariff was increased in 1931, were practically stopped by the embargo, and only small amounts have been brought in under special permits since the embargo became effective. In 1934, after the measures to reduce domestic hog numbers had begun to take effect, import quotas for live hogs, especially those which applied to lard hogs, were liberalized. Since lard hogs do not compete directly with domestic hogs, Austrian tariffs favor the importation of the latter, and for quota numbers of hogs weighing over 150 kilograms (330 pounds) no tariff applies.

Present System of Imports

Since 1934, imported live hogs have supplied practically all of Austria's pork and lard requirements not met by domestic hogs. Fresh pork, principally in the form of carcasses, and some fatbacks come in regularly from Yugoslovia under terms of the trade agreement, but bacon imports have stopped entirely and lard is imported only when a shortage is imminent.

Austrian import duties on hogs and hog products, 1926-1936

Product and date effective	In foreign units a/	In United States currency b/
	Gold crowns per head	Dollars per head
Hogs, weighing:		
Over 10 kilos and up to 40 kilos:		
1926 (Aug. 5)	8.00	1.62
1927 (Nov. 21)	12.00	2.43
1936	12.00	4.13
	Gold crowns per 100 kilos	Cents per pound
Over 40 kilos and up to 110 kilos:		
1926 (Aug. 5)	9.00	0.83
1929 (Jan. 10)	18.00	1.65
	Gold crowns per head	Dollars per head
Over 110 kilos:		
1926 (Aug. 5)	3.00	0.61
1929 (Jan. 10)	Free	Free
	Gold crowns per 100 kilos	Cents per pound
Over 40 kilos and up to 150 kilos:		
1931 (July 19)	18.00	1.65
Over 40 kilos and up to 135 kilos:		
1933 (Oct. 11)	18.00	2.31
Over 135 kilos and up to 150 kilos: c/		
1933 (Oct. 11)	Free	Free
1936	Free	Free
Over 150 kilos:		
1931 (July 19)	Free	Free
1936	Free	Free
Pork, fresh, frozen, salted: d/		
1926 (Apr. 14)	12.00	1.10
1929 (Jan. 10)	26.00	2.39
1936	26.00	4.06
Bacon, salted or not:		
1926 (Aug. 5)	3.80	.35
1931 (July 19)	22.00	2.02
1933 (Aug. 31)	25.00	3.21
1936	25.00	3.90

Continued -

Austrian import duties on hogs and hog products, 1926-1936, cont'd

Product and date effective	In foreign units a/	In United States currency b/
	Gold crowns per 100 kilos	Cents per pound
Lard (melted hog's fat):		
1926 (Aug. 5)	3.80	0.35
1931 (July 19)	30.00	2.76
1931 (Oct. 24)	10.00	.92
1932 (Jan. 15)	30.00	2.76
1936	30.00	4.68

Compiled in Bureau of Agricultural Economics and verified by Bureau of Foreign and Domestic Commerce.
a/ Conventional or treaty rate applicable to the United States; where no conventional rate, the general rate applies. b/ Conversions into United States currency made at average annual exchange rate for the years shown. c/ New classification. d/ Except overseas frozen meat, subject to duty of 15 gold crowns per 100 kilos since August 10, 1926.

At present, most imports of live hogs are obtained under the terms of trade agreements with Poland, Hungary, Yugoslavia, and Rumania. Annual import quotas are granted to those countries; and, since attempts are made to regulate weekly market supplies, weekly quotas vary with changes in the domestic supply situation. At times, extra import quotas over and above the quantitiy provided for by trade agreements have been granted to the exporting countries, and in return Austrian exports have been given preferences. Actual weekly shipments do not always conform to quotas, because of supply conditions in exporting countries and price situations in Austria and other importing countries. In early 1937, weekly import quotas were about as follows:

	Lard hogs	Meat hogs
Poland	150	2,100
Hungary	11,800	400
Yugoslavia	2,000	400
Rumania	850	-
Denmark	-	150

Conclusions

Austria's policy of importing needed pork and fat supplies in the form of live hogs represents a return to pre-war trade channels. This return was such an economic necessity that it has not been prevented by the political boundaries established by the peace treaties. Developments in Austrian foreign trade and agricultural policies give an indication of the difficulties confronting the trade in American lard with those European countries which have been forced to accept lard and pork from surplus hog-producing countries in exchange for an export outlet for their own industrial goods.

Most competition for American lard on Austrian markets, consequently, comes from live lard hogs from the Danube Basin, and not from domestic hog production or artificial fats. The price and quality advantages of American lard and the fact that the Austrian trade would favor its return to Austrian markets have to date been outweighed by the advantages of importing live hogs, paying for them with Austrian goods, and processing the hogs in Austrian plants with Austrian labor.

The greatest disadvantage resulting from Austria's practice of obtaining lard supplies in the form of live fat hogs is that, so long as domestic production remains at or near present levels and imports of specified numbers of meat hogs are necessary for trade reasons, pork surpluses frequently occur. If the so-called lard hogs were all Mangolicas, which yield a high percentage of lard and a low percentage of inferior pork, the situation would not be so difficult. But many of the hogs imported as lard hogs, particularly those from Rumania and Yugoslavia, are meat hogs or meat-hog crosses merely fattened to lard-hog weights, and they produce a relatively high proportion of pork, which is competitive with pork from domestic and imported meat hogs. Austria is not in a position to export the surplus pork in competition with the "natural" hog-producing countries, and when it is offered on the domestic market further undesirable effects are noted on the already depressed cattle industry.

During the past 2 years, in which the results of the 1934 and 1936 droughts in the United States and impediments to trade in European countries have greatly reduced supplies of American lard on Central European markets, the Danube Basin has been called upon to supply increasing quantities of live lard hogs, fatbacks, and lard to Austria, Czechoslovakia, and Germany. With frequent small crops, rather limited hog numbers, and lack of facilities for handling seasonal or other surpluses when they occur, it is becoming evident that the Danube Basin is not only a limited but an undependable source of supply and is certainly not in a position regularly and adequately to meet the import requirements of the deficit fat countries of Central Europe.

It would appear to be to Austria's advantage to continue to import lard hogs, but only in numbers which would not result in a pork surplus, and import the remaining lard requirements in the form of lard. In Austria, as in other deficit fat countries in Central Europe, a reserve of floating lard stocks would tend to act as a stabilizing factor and to counteract the effects of irregular shipments from the Danube Basin.

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RECENT DEVELOPMENTS
IN
FOREIGN AGRICULTURAL POLICY

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RUMANIAN GOVERNMENT PLANS REORGANIZATION OF AGRICULTURE

Recently adopted in Rumania is a law designed to bring about a better organization of agriculture and to guide the peasants toward a more rational use of the agricultural resources of the country, according to a report from the American Embassy in Bucharest.

In 1921 a law was enacted providing for the break-up of the large estates and the redistribution of land. It soon became evident that, with a rising birthrate and a firm attachment to the practice of dividing a farmer's land after his death among his children, the existing individual holdings would soon be too small to support the new generation of peasant families.

The new law is intended not only to remedy that situation but to provide, in addition, for the development of agricultural enterprises along lines specified in an "agricultural plan." The first objective of the law is covered under a general title headed "Transfer and Mortgaging of Rural Agricultural Property Obtained From and Through the State." Under this section, no agricultural land obtained by peasant farmers under various legislative acts since 1864 may be sold or given away except upon authorization by the State.

Moreover, the purchaser, the inheritor, or the person who comes into possession of former State-owned property, obtained under the above-mentioned legislative acts, must be duly entitled to receive former State-owned land, be a graduate of a school of agriculture, forestry, or veterinary science, and have agriculture as his main occupation. No one family may acquire more than 50 hectares (123.5 acres) of such land, and holdings may not be divided into parcels of less than 2 hectares each.

The first section of the act also provides for eliminating the situation arising from the fact that in many areas the peasants own a number of widely separated and small parcels of land. This land may be redistributed, under the direction of the Government, whenever 66 percent of the landowners of a given rural commune have holdings aggregating 10 hectares or less and if the owners of at least 51 percent of the total land of the commune in question request such procedure.

Finally, this section of the act provides that whenever the division of an estate by inheritance would result in dividing the holdings into plots of less than 2 hectares each the State may exercise the rights of preemption. Before exercising that right, however, the nearest neighbor shall have a right to purchase the land and is to be advised by the Government that the property is for sale.

The second objective of the law is covered under the general title headed "Direction and Rationalization of Agricultural Production." This section of the act gives the Government sweeping authority in respect to such matters as the utilization of high-quality seeds, means for fighting plant pests, encouragement and use of modern agricultural machinery, assistance in obtaining improved stock for breeding, standardization of agricultural products, rentals of farms, tenancy conditions, agricultural wages, and subsidization for the encouragement of agricultural production.

Moreover, this section of the act authorizes the Ministry of Agriculture to make a survey of the agricultural resources of the country and to draw up plans for the "rational agricultural exploitation of each region." The objective is to bring about the adoption of a plan of agricultural development in which each region would specialize in the production of the commodities for which it is best fitted. The law authorizes the Government to enforce the compulsory adoption of a plan of cultivation whenever 66 percent of the owners of land or any commune favors such a plan.

To carry out the program envisaged by the act, the Government is authorized to grant tax exemptions, exercise supervision and control, establish model farms, establish minimum prices for agricultural products, advance credit to peasants, and exempt agricultural machinery from the payment of import duties.

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PORTUGAL ADOPTS CORPORATIVE FORM OF AGRICULTURE

A new law (No. 1957), placing Portuguese agriculture under the direct supervision and control of the State, was enacted on May 20, 1937, according to a report from R. J. Fernald, Secretary of the American Legation at Lisbon.

The law lays down the general lines for a corporative organization of the nation's agriculture. This is to be effected through agencies called "Gremios Lavoura" (Agricultural Guilds). The area over which such guilds will exercise their activities ranges from groups of parishes to an entire provincial district. Guilds may be set up either upon the initiative of groups of farmers or by the Government.

The functions of the guilds are far reaching. They may exercise, either themselves or through organizations of a superior grade, the functions conferred by the constitution upon corporative organizations. They are expected to develop a spirit of solidarity and cooperation between all elements of production (i.e., capital, technical assistance, and labor) for the advancement of the well-being of the community.

The law also provides that they shall contribute to the economic development and technical improvement of agricultural production. In the attainment of that objective they are authorized to compel compliance with legal provisions and regulations issued by the corporative organizations set up by the State and to guide and discipline the activities of their members in accordance with the best interests of the nation.

The guilds are also authorized to promote the sale and marketing of farm products by grouping producers and enforcing regulations laid down by the State for the protection of the national economy. Moreover, they are given authority to own and operate stores, granaries, agricultural machinery, and livestock and to install various services for the common interest of the members.

Provision is also made to facilitate the collection and acquisition by the guilds of such materials and implements as are needed for the agricultural activities of their members. In all activities relating to the development and technical improvement of production or to the professional training of agricultural workers the guilds must cooperate with official organizations already dealing with agriculture or with the raising of livestock.

The law further provides for the establishment of agricultural credit funds, cooperative branches of production and consumption, and any other form of cooperation legally permissible, including the collective ownership of cattle, for the exclusive benefit of members of the guilds.

The guilds will be financed by monthly dues of members, the commissions on commercial transactions, the profits from services operated for the common benefit, the revenue from services of public utility assigned to them, and the proceeds from fines, subsidies, and seizures.

Penalties may be imposed by the presidents of the guilds upon delinquent members. The law also provides that, whenever an agricultural guild fails to cooperate satisfactorily with the Government in fulfilling the purposes for which it was established, its license may be withdrawn, the guild dissolved, and its directors punished.

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CUBAN GOVERNMENT CONSIDERS LAND DISTRIBUTION SCHEME

A bill has recently been introduced in the Cuban Congress providing for the establishment of independent farmers by means of a distribution of agricultural land, according to reports received in the Bureau of Agricultural Economics from American consular sources. The bill would authorize the State to acquire all land that is not cultivated and to distribute the same to Cuban citizens engaged in agricultural work.

Such land would be distributed only to native-born or naturalized citizens who are the heads of families and are actually engaged in agricultural work. The Government would require rental contracts from farmers taking over such land. After residing on the land continuously for a period of 10 years, the farmer would have an option to purchase it upon payment of the difference between the rent paid and the amount originally paid for the land by the Government.

The area of land that may be distributed to individual farmers under the bill varies in accordance with the size of the family. Thus, two caballerias (one caballeria is equal to 33-1/3 acres) would be distributed to a native-born or naturalized farmer whose family is composed of three persons, while five caballerias may be obtained if the family consists of eight or more members. Five caballerias would be the maximum allotment in any case.

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